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“КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ ІМЕНІ ІГОРЯ СІКОРСЬКОГО”

ФАКУЛЬТЕТ ЛІНГВІСТИКИ

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The Conference attracted over 500 students and postgraduates.

The publication is intended for scholars, undergraduate and postgraduate students from Ukraine involved in research and development work in different fields of science and technology.

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SECTION: MODERN INFORMATION TECHNOLOGIES

WHY YOU SHOULD CHOOSE GO LANG

Daryna Akhmedova
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

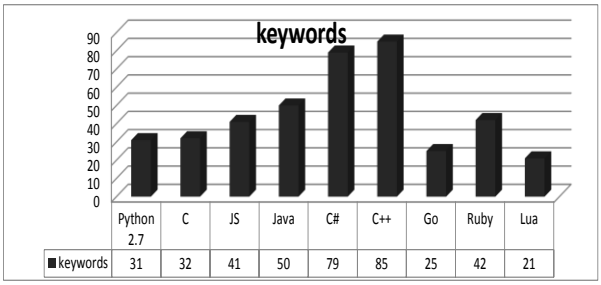
People are trying to convince us that the art of creating the programs are available now the same as the alphabet. But, unfortunately, this is not the truth. Anyone with a minimum experience of software development knows that for a moment of using the keyboard stay hours of training. We have to admit that programming is difficult, both technically and ethically. Computers, at the moment, only execute commands of varying degrees of complexity. And the developer has to be clearly understood: the machine does that, what the programmer says, and not that, what he means to say. One of the tools reduces the complexity of development – it correctly chosen programming language. And every round of their development, anyway solves one aspect of the complexity of software development, but and introduces new elements of complexity. But some languages bring more complexity to the overall complexity of the pool, while others less.

In our world we have the introduced complexity. This is the complexity, which is derived from the tools that we use. This is the complexity that we create ourselves. We can affect and reduce. In this regard, Go programming language appeared, as a response to an increased of "the introduced complexity" of the existing languages.

Go is a radical language that shaked the swung to the other side of complexity, trying to align the existing landscape of the world of software development.

And that is exactly that, what is meant by the term "simplicity" in the context of Go. Reducing complexity. Reducing the time required for the understanding of the programmer project written by other people. Reducing the risk of errors. Reducing the chance to write the code is bad and ugly. Reducing the time to learn the language.

After analyzing the popular programming languages on one of the most common methods – counting keywords language, you can see that Go lang is one of the best in this parameter.



Scheme 1

As Tony Hoare said – professor, who was involved in the implementation of Algol 60, who is a researcher at Microsoft Research "There are two approaches to programming. The first – to make the program so simple that there is obviously no

errors. And the second – to make it so complicated that there is no obvious errors". Fortunately Go lang lets you create programs and related to the first approach of Tony Hoare.

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MODERN BLADE-SERVERS

Svitlana Andriets
Faculty of Radio Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

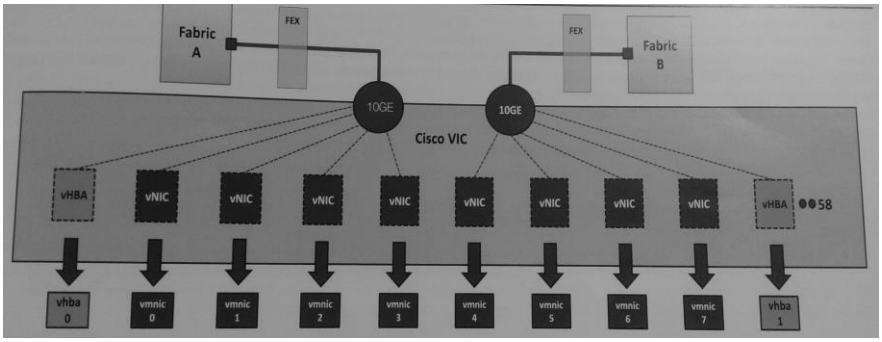
Today, IT is one of the fastest growing, costly and promising areas. The discoveries and innovations that offer developers in many ways not only satisfy human needs, but are a pair of steps ahead of the overall development. The impetuous evolution is foremost caused by a wide field of action, because IT covers all resources required for information management, as well as software and networks used to create, store, manage, broadcast and search of information.

Very relevant is the question of realization and improvement of server monitoring, management, virtualization and access to the storage systems. The working of specialists is focused on minimizing the dependence and necessary presence of human during operation of machines.

Server hardware is designed to perform specific tasks in the mode "all the year round / seven days a week / twenty-four hours", that is why it is important to provide reliability and infallibility of this work [1]. Data transfer rate is the most significant characteristics in such equipment. Today, the maximum data transfer rate by fiber optic is 10 Gbit / s is provided by a blade-server.

There exist a large variety of blade-servers that with maximum efficiency equip any space for work. They will function of the solution for specified tasks, taking into account all necessary criteria and features.

Consider the constructive layout of blade-system of Cisco UCS kind. At the heart of the system are commutators – Fabric Interconnect, that have built-in functions of UCS Manager. It allows managing all servers, firmware components, routing, virtualization and automation. Power supplies and blowers are controlled by FEX (Fabric Extender). FEX also paves the multiply 10 Gbit/s connections between the blade-servers and Fabric Interconnect. VIC (Virtual Interface Card) is network



Pic. 1. Constructive blade-system

adapters which enable running several network links through a single communication channel. Such a unique architecture provides full scale control and management of servers in physical and virtual environments. It also simplifies the transition to the cloud computing and model "IT as a service", based on a matrix infrastructure. The use of such servers can significantly reduce the number of devices that are needed to be install and maintained.

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MILITARY DRONES

Olexandr Anyakin

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, modern warfare is mainly oriented for a local warfare at the battalion level. Experience of Syria and Donbass conflicts showed us many new aspects of combat at this level. Even having an artillery, tank and aerial support mechanized infantry need constant data stream to stalk enemy's location, number, armament and movement to target high-accuracy weapon.

Nowadays, various drones are widely used for these purposes with a great success. Why? First, drones are mainly quite enough and small to not be located and eliminated by most of hostile's anti-aircraft defenses. The newest machines have been created using "stealth" technology that makes them even harder to locate and hit precisely with guided missiles or AA artillery.

Now, the main armament to deal with unmanned flying combat vehicles is portable AA missile launchers and AA artillery in case that drone already been detected visually. How painful can be a single scout drone? In addition to intelligence data about your number, position and armament, it can correct incoming guided missiles and artillery shells with devastating effect and accuracy. Being infiltrated behind the enemy lines, drone can find a headquarters and deliver a direct strike with tactical ballistic missile with grief consequences.

However, combat drones, that deliver deadly cargo itself, are used only in the USA. Other UACV are remastered from civilian drones, like used by separatists at Donbass. Attack drones, such as MQ-1 "Predator", are widely used by US military in Afghanistan and at the Near East to eliminate terrorist leaders.

Modern combat drones have a large number of weaknesses. First, they can easily be spoofed, disoriented and captured by enemy with all secret data aboard. Second, they are much larger than most of scout drones and far more vulnerable to AA fire. Such machines, as MQ-1 can be used only against technically inferior opponents. In addition, their armament is mainly too weak to deliver required amount of damage.

However, these problems do not stop developers. In upcoming 20-30 years, UACV can acclaim place in battle right between infantry and armored vehicles due to

their speed, agility and maneuverability. Just imagine an infiltration of even the small pack behind the frontline. They well harass communication bases and stockpiles, AA and artillery positions. Such effectiveness requires greater level of science and knowledge.

In addition, it will cause special anti-drone weaponry development and improvement. Moreover, drones require competent specialists and operators to be controlled, because their autonomous usage can cause a vast number of civilian casualties, like in Afghanistan.

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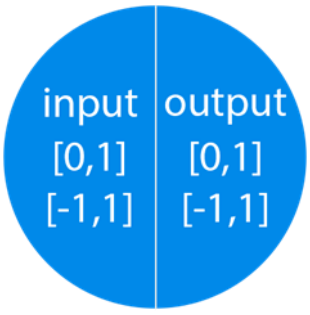
NEURONETS

Viktor Artiushenko
Institute of Mechanical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The neural network is an educational system. This is the sequence of neurons connected with each other via synapsis. Unlike conventional programs it operates not only under a given algorithm and formulas, but based on the past experience. Performing the same tasks as a man it makes fewer mistakes.

The neural networks appeared on the basis of experiments in the field of artificial intelligence from the attempts to create a system which can learn and correct mistakes like any biological system. Patterson made first attempts in 1996 and found out that the process of our thinking was built on the manipulation with symbols. But all these attempts were useless because they didn't take into account the important aspects of human intelligence.

This failure led to the important conclusion: in order to create artificial intelligence it is necessary for it to have the structure similar to the human brain. The basic unit of the neural networks and a brain is a neuron.



The principle of operation of a neuron is: a neuron receives numerous signals (on average 10000000000) but is activated only in case the total number of signals coming into the core exceeds the certain level (the level of activation).

An artificial neuron is a computing unit which gets information, carries out simple calculation and passes a binary code further. Each neuron has two main parameters: input data and output data. In other cases, the summarizing information from all neurons from the previous layer goes to the field input; then it becomes normal via the function of activation and goes to the field "output".

Neurons operate with numbers in the range of [0,1] or [-1,1]. Normalization is necessary when the number which doesn't belong to this range must be processed. Thus, the number must be divided to this range divided by one.

If mentioned properties are translated into programme code, the programmes can be created which will be able to detect other objects: people, buildings or they will define letters only according to their images.

To sum up, neural networks are necessary for solution of difficult monotonous and dangerous tasks which contain a lot of analytical calculations. There is a possibility of new applications because of the development of new technologies. Nowadays the systems based on life experience are already used in autopilot of cars that can find out the type of the road and recognize objects surrounding a Vehicle. In future this technology will be widely used in robotics.

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CLOUD COMPUTING TECHNOLOGY IN OUR LIFE

Anastasiia Babich
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Recently, we saved everything important in notebooks, kept the music on CD or downloaded from the Internet all interesting information to our computer hard drive. Today we publish all personal information in social networks, use cloud services, multiple applications and refuse to exist without virtual reality. Just a few years ago your computer was your fortress. You have stored all the most important information on your PC. You were disconnected from the Internet, and your personal details were safe. There were no Dropbox and Google Docs, and even Skype, Evernote, Adobe Creative Cloud and many others. Step by step cloud systems insensibly entered to our lives.

Cloud systems are a model providing a convenient network access to computing power and resources on a remote server in the Internet. The customer can control and connect to unlimited technical resources from any device.

Cloud systems facilitated the life to the level when you don't have to install programs on your PC and set it up. You can just work with it directly in clouds. It's possible to download all your video, audio records into cloud server and it won't occupy free space on your devices.

Internal communications in the company, working on business projects, processing and analyzing data arrays, everything moves in the cloud systems nowadays.

The advantages of cloud systems are:

Flexibility: resources are allocated automatically.

Reliability: it has high reliability.

Mobility: ability to manage from anywhere.

Adaptability: ability to tap into the vast resources.

Accessibility: anyone can connect to.

Possibility to rent: you can choose the package that is required now.

Economical: low costs of equipment and service.

In the nearest future we will have a service that will carry all the computer functions into the cloud systems. Everything you will need is small remote controller, like your phone or tablet, and access to the internet. You will be able to control system with infinite capacity and capabilities. It will radically change the quality of our life, economics and other industries.

Business. All stages of production will be tracked and monitored. Modification of production will be carried out depending on the needs of the customer. During the production of any technologies, people will be able to identify any probable defects. Each product will be modified according to current customer needs. The product will become a service.

Monitor changes in climate. Billion sensors connected to the system will give ability to control the pollution of the environment. Global disasters like forest fires, landslides, floods, and earthquakes will be forecasted in advance.

Drinking water. Generating such data as the pollution of sewage, water leakage in a certain area, the backwardness of agricultural technology will solve many problems that deprived humanity of water.

Health. Sensors will permanently monitor the human health and analyze his vitals. Everything will be recorded and noticed by sensors, even when man falls, the unit will alarm immediately, it will help elder people and people with disabilities.

OBTAINING A HAND'S CONTOUR FROM A VIDEO STREAM'S SHOT

Svitlana Babych, Halyna Halkina

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The paper is dedicated to a method of hand recognition during a live video stream.The method's main idea is to use the scene context in addition to the skin's color and the contours in the picture when performing a search [1]. This context may be represented by the picture's alteration caused by the hand's movements when gestures are shown [2]. Thus, it can be assumed that the hand's contour will match or be included in one of the area contours which have changed as compared to the base picture.

The suggested approach is based on two phases: the preprocessing phase (it includes saving the color and appearance of the background) which is performed before the main algorithm and the hand's contour recognition itself [3].

The steps of the operator's hand contour detection algorithm are listed below.

Step 1. Change the picture format to HSV.

Step 2. Identify dynamic contour areas (which differ from the memorized background).

2.1 Remove the background from the current picture.
2.2 Obtain a set of all areas contours with changes in background.

Step 3. Search for an area with the hand's color.
3.1 Use the histogram to calculate a probability of belonging to the hand for each pixel.
3.2 Forming a set of contours selected at the step 3.1.
3.3 Choosing the largest area.
3.4 Calculating the area's from the step 3.3 centroid.

Step 4. Obtaining of the hand's contour.

4.1 Choosing a contour containing the centroid obtained at the step 3.4 among the contours got during the step 2.2.

Thus running the present algorithm for each of the shots we will obtain a hand's contour for it.

The given method has a number of advantages: 1) hand's precise contours; 2) lesser dependency on the illumination and the picture's quality; 3) independence of the operator's skin pigmentation.

Some disadvantages are also present, including these: 1) a need for a stable and still background; 2) lower quality of recognition when the operator is on the video.

The recognition's quality can be improved if the repeated usage of a bar chart for elaboration of the skin areas without the redundant areas is added to the step 4.

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WHAT YOU GET WITH SERVER COLOCATION

Vitaliy Bal
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Colocation hosting is the possibility given to a business to rent some data space on a server which is secured by a server administrator employed for this purpose. The business pays for this space which is in a data center and for the professional assistance provided by the administrator who makes sure that the applications and the information on the server run smoothly [1].

There are a lot of benefits involved in a service like this. For instance, despite higher fees than shared web hosting, the major benefit comes from the fact that the business owns its own server or it has access to a rented server in a dedicated hosting. This way, the business may access and use their applications more rapidly if they are their own server host. If the data center is remote the access and the employment of these applications use a lot of bandwidth. The collocation does not exceed its bandwidth offer if data is accessed occasionally.

A lot of businesses opt for a managed collocation due to the fact that capital expenses relating to updating technology are too daunting and not practical especially nowadays when technical acquisitions depreciate and become rapidly obsolete. Opting for a managed collocation, when businesses can remove this financial burden and are no longer responsible for refreshing the technology, as the professionals from the data center will be taking care of everything.

Another plus is that all systems are applied and are well accommodated for server collocation. Most of the hosting providers can support any operating systems unless it is not the Red hat Enterprise. The rest of Linux Distribution, such as FreeBSD or Debian is right for you. This way a business keeps the control; experts customize and administer the server ensuring smooth operating and preventing failures [2]. The server colocation is one of the most modern and attractive solution for businesses (large or small) and individuals who want to benefit from owning a very popular site which has thousands of daily hits and are not necessarily willing to pay for the required bandwidth. Still, there is the charge for renting the server, but the costs are lower.

The professionals from the data center that manages your server store all downloaded or transferred data onto the server and then they physically move the server to a different location which will be from now on the headquarters of the provider for your server colocation. The provider assumes control and responsibility over the server and connects it into their stand. In fact, the owner of the collocated server shares the bandwidth with the provider, hence reducing the costs for the bandwidth. Also, if a business needs a server but does not have one, it may rent one instead of buying and by doing so it will not own any part of the collocation process only the data transferred through the rented server.

As soon as the server is set up the clients receive the IP address allowing them and their customers remote and easy access to the collocated server. In cases of heavy traffic and downloading high density files this option may prove extremely cost efficient as the business avoids paying extremely high charges for a high bandwidth as this responsibility is placed with the data center. The data center charges the site owner exclusively for the used server space. Another advantage of the server colocation is represented by the fact that the client is provided with the most updated technology in order to deal with the problems that might arise such as: power outages, rebooting or system failures. Besides, the location of the server is much more secure in a data center than in a home or office [3].

Colocation services help you locate your equipment in third party data centers. It usually refers to cloud computing providers and internet providers who set up the electrical power, the space and super rapid Internet links for your web servers. Opting for this kind of service takes away the burden of building your own secure facility which will provide your company with power and technology. Also, these collocation centers are generally situated in the vicinity of important Internet connecting points, thus easing the access to a multitude of Tier 1 Internet backbones.

Much of the monitoring of the equipment is performed by you from a distance, but the collocation data center provides both maintenance and troubleshooting systems. It basically hosts your own server hardware and you only pay a monthly fee

which covers for bandwidth, rack space and cooling. This is an ideal service for businesses which need quite large hosting requirements but will not lease a dedicated server from the provider.

There are lots of advantages of server collocation and one of them can be associated with the fact that you are no longer in charge of assisting and securing your server each time it needs to be rebooted or reinstalled. The experts from the data Center will provide these services for you and they will also give you complete access and control of the server with terminal access or KVM-IP. Besides, server collocation may spare your business the costs related to web hosting bandwidth charges.

As soon as your server installation is finished, the Data Center professionals provide you with the connectivity instructions and the IP address, so that you are able to connect to the website, software and applications which have been installed on the collocation server. This is the ultimate cost effective and undemanding solution to house technological infrastructure without the risks of losing administrative control of your equipment.

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SOLVING PROBLEMS OF STORAGE AND INFORMATION ACCUMULATION USING BIG DATA

Kateryna Barabash
Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Huge amount of data is generated daily, and its number is increased every day. We are faced with the problem of storing the information and analyzing it.

Big Data is not only a large amount of the information; it is moreover its processing methods, which allow us to distribute the processed information. It can not be processed on a single computer, nor in a single data table.

The scientists are trying to solve this issue by using different methods, like the system expansion and the data localization. For qualitative data, it would be necessary to follow specific algorithms, which are the integrally cast-point definition of a specific task of analytics and destination research.

Working with big data, we can face the challenge of overcoming the unnecessary hurdles in large amounts of data. You need to find ways to solve these problems, for example in the entity analytics. The main task of entity analytics is to analyze the data sets and find how many observations are related to the same person, which are currently viable and which one are suitable for usege.

So, the importance of Big Data is the ability to use large amounts of data in order to separate them into groups and clustering. Even today in many areas it is impossible to solve some problems without using of large data processing methods. For example, biomedical engineering which development is acquires momentum, problem of decoding human gene requires significant costs, both in time and in the way of saving the data.

Therefore, the development of topic Big Data, will contribute to the development of other sciences.

Actually, Big Data can improve the quality of all areas of life and business. A few years in the future, it will be possible to see advertising billboards with constantly changing pictures, tuned for the tastes of each individual. This IT direction has a great future, and soon we won't be able to live without the processing capabilities of Big Data.

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YARN – PACKAGE MANAGER FOR JAVASCRIPT

Maksym Berezynskyi

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Facebook has officially announced a new package manager for JavaScript called Yarn. At one stage of development connected to the project of Google, Exponent and Tilde.

Facebook developers claim that Yarn still allows access to the NPM packages, but it is faster and allows to manage dependencies between the machines more consistently, or to work in a secure environment in stand-alone mode. This, according to the creators of Yarn, will allow developers to focus on what really matters – on the creation of new products and features. Here is a list of the main distinguishing features of Yarn: offline mode; network performance; having multiple registries; network flexibility; availability Flat Mode; More Emoji (and seals, too).

In the social network therewere several reasons for creating their own alternative to NPM. Of course, the most important of these was the performance and speed of installation, and parallelizing operations. Moreover, Yarn allows to achieve uniformity on different machines. In the case of NPM, depending on the connected modules, node_modules directory could differ greatly from machine to machine. In the case of small teams, engaged in development, such customization may be acceptable, but not in the case of a huge Facebook DevOps-team.

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REVIEW OF THE OPTIMIZATION BY MATHEMATICAL PROGRAMMING

Evheniy Bershadskyy

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Optimization is an important tool that can keep huge amount of savings to your organization. Programming is the way you can reach this goal automatically and faster. Practice says that this goal could not be achieved in another ways.

Mathematical programming works with problems that would not be solvable by other methods, because of their size or other features.

In major cities, for example London, mathematical programming models influence the control of the flow of domestic water through the city as the model is used to determine the most efficient strategy to move water from source to user as peaks and troughs in the usage pattern develop. Thus, the results from mathematical programming models are literally all around many of us.

What does it mean to model a particular system? First one needs to abstract the essence of a situation and then represent it mathematically. This representation is then mathematically manipulated to provide some useful information.

Finally, the knowledge gained from this information should be translated into an action for the system, situation, or problem at hand. Some mathematical models are used to generate possible candidate decisions or solutions to problems. Other models can be used to evaluate particular, possible sets of decisions.

It is important to distinguish models and solution algorithms. A model describes a situation. Models are a (usually mathematical) representation of a problem. A solution algorithm finds one (or more) solutions to the situation or problem. There could be a variety of algorithms or methods to solve the problem.

Mathematical programming has been used often to provide solutions to many industrial problems. A good example can be found in Kim et al. (2003). They develop a life cycle optimization model to determine optimal vehicle lifetimes, accounting for technology improvement of new models, while considering deteriorating efficiencies of existing models. The model uses dynamic programming. Input parameters include material use, energy, emission factors, and fuel economy over a 36-year time horizon.

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ADVANTAGES AND PERSPECTIVES OF USING ARTIFICIAL INTELLIGENCE

Nickolas Biletskiy
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Artificial intelligence (AI) is an intelligence exhibited by machines. In other words, it's a flexible computer program, which perceives its environment and takes actions that maximize chance of success. AI went from fiction to reality less than century ago. Alan Turing, British mathematician and WWII code-breaker, is widely credited as being one of the first people to come up with the idea of machines that think in 1950. Then the idea of AI became a great idea for science-fiction books, films, comics etc. Thanks to that, idea of thinking machines becomes well-known even at public. The rise of the personal computers in the 1980s sparked more interest in machines that expected [1].

With foundation of Big Data AI becomes necessary, because a human can't analyze such huge amounts of data. That's why nowadays we have correct weather forecasts, fast search engines, which take less than second to process user request, different social networks, and navigation systems and so on. AI is the result of titanic work of programmers and mathematicians, who create fast algorithms and programming logic.

However, these are not the only possibilities of AI. After creating speech recognizing systems, AI got a wide field for perfection. Everyone knows such systems as Apple Siri, Microsoft Cortana, Google "Now on tap", which are examples of AI personal assistants. In my opinion, next steps will be: creation such assistants for call-centers, interactive shop assistants and even AI doctors, which can help you provide first aid. I hope, that in a couple of years we'll see self-driving cars, such as Apple "Project Titan" or Google self-driving car project, which is currently being tested on American roads. Such cars will make driving less dangerous and easier.

Simultaneously, thousands of engineers are working hard to inject AI into robots, to create intelligence androids. Such robots could be used to work at dangerous jobs: they can replace not only police officers, firefighters, miners, but pilots, drivers and even teachers, doctors, etc. Nowadays, such robots are already have been designed and used by medical professionals to practice, to copy human facial expressions and so on.

The field of AI development is very interesting and perspective, but on the other hand it could be a source of different problems, such as massive unemployment, different kinds of mutiny by haters of machines.

Also in science fiction there are a lot of scenarios of doomsday after machine revolution, which seems to be not far from reality. Indeed, there are a lot of problems to solve in the sphere of the development of artificial intelligence. What if machines could be filled with human emotions and become evil? What if machines would decide, that humanity is a danger?

So scientists must approach the the problem very carefully and create machines and programs which would serve the humanity.

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USING OF GENETIC ALGORITHMS IN COMPUTER MUSIC GENERATING

Nataliia Bondarenko

ESC 'Institute for Applied System Analysis', NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Is it possible to find patterns in the melodies, arrange music into its component parts and figure out how musical combinations influence listener's emotions and feelings? Why a simple change in the gamma is so differently perceived by the listener in different contexts? Does an ideal musical composition exist? Composers of all times have been trying to find answers to these questions. Maybe our generation should try to find the answer, as we have such a powerful tool as a computer at our services.

Algorithmic models have proved themselvs as a good instrument for applied problems solving. So it seems to be naturally to try using them at music researches.

J.Holland supposed that a pleasant melody is a result of a natural selection of random sounds. His treatise, written in 1975, has laid the groundwork in researches of evolutionary programming.

Holland's genetic algorithms have a basis in Darvin's theory about natural selection. The principal term for algorithm to operate with is a *population*. Population is a set of individuals with every individual representing potential solution. Each candidate is evaluated using a fitness function, a heuristic rule to measure its quality. A new generation of individuals is created during a mating process. Each candidate's ability to produce children depends on its fitness function value. As children inherit traits from thier parents, features of unfit solutions will dissapear step by step. An interbreeding of candidates with the highest fitness function values leads to concentrating of search in the most promising areas.

The use of genetic algorithms in the field of music generation has its own particular qualities. There are several ways of translating music to binary code. The first is to code musical patterns (a sequence of notes). Another way is to code rythm sequences, which is layed on notes afterwards.

In order to work with a specific research area we need extra operators in addition to the basic to process data:

- Transposition – rearrange the notes in a randomly selected fragment.
- Sorting – sort the notes in a randomly selected fragment.
- One-note – replace one note to another in a randomly selected fragment.
- Length redistribution – change a duration of notes in a randomly selected fragment.

The hardest thing is to determine measure of individual fitness (fitness function), that must evaluate musical composition objectively. If the music is to be evaluated in terms of subjective aesthetic quality, it may become impractical or directly impossible to define a formal fitness function. Because of these inconveniences, many researchers have resorted to implement the fitness function with human evaluators. This class of evolutionary algorithms represents a substantional percentage of the total body of work on algorithmic composition. That's why it has its own term to describe it – musical interactive genetic algorithms (MIGAs). The most famous implementation of MIGAs is the GemJam program, which is the system for jazz solo generation.

Representing fitness function as a weighted sum of composition parameters seems to be a way of quality evaluation. Parameters may be simple like speed of playback or position of notes in a general flow or complicated like resemblance to predefined composition or set of compositions what represents a style. Existing software products that have this approach at their basis, show quite good, but not fantastic results.

One of the latest and most successful results in evolutionary computer music is known as a achievement of scientists of university of Malaga. According to this approach compositions are developing in an environment ruled by formal constraints and aesthetic principles. Restrictions accompany the track throughout the process of its creation. They can be very common (the notes have to be playable on the instrument in question) or more specific (features like the melodies and harmonies fit with what is typical for that style). Step by step, the random fragment becomes more and more like real music, and the evolutionary process stops when all the requirements are met.

This approach that uses dynamic fitness function allows not only to follow the existing patterns but create a brand new music. The technology has already been implemented in a program called Iamus. Songs created by Iamus and performed by the most famous orchestras in the world are recorded on the discs. They surprise even the most sophisticated music lovers.

The searches for the methods of creating natural and pleasant compositions are still continuing. The creation of computer music demands many efforts and time, as musicians and algorithmists speak different languages sometimes. Evolutionary algorithm is a good way to join efforts, as it describes the process of creating music by compositor in terms which are easy to understand for math specialist. Computers proved their ability to think and make decisions. Thus, creation of computer musical masterpiece seems to be a difficult but feasible problem.

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SCREENSTER

Olha Bosenko

Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today test automation is very important for progress in Selenium software testing. Screenster is new platform automation Web Testing. It is tool that validates the screens that users actually see.

The actuality of this topic is that people nowadays need to test application fast and qualitatively. This innovation has great implications for the Visual Regression Testing.

The idea of self-test mechanism based on a comparison of screenshots appeared in AgileEngine in 2013. Screenster 1.0 version was released in May of 2016. The main audience is testers without without programming experience. It helps greatly increase the speed and performance of the test in comparison with Selenium and other frameworks, for which you need to write code.

There are many advantages, such as testers don't need to install anything on the local machine. Test's recording and launching is processed on the server in the local network or in the cloud. Web page testing is done by comparing their screenshots. Tester indicates start URL and this page is loaded into the workspace. Tests don't require writing code at all.

Screenster allows us to work with pages written in AJAX. Update processing is occurred automatically. It prevents software configurable pauses and other complexities of asynchronous systems.

There are several features:

- Cross-browser testing.
- Record and play back.
- No need to read manuals.
- No need to write code.
- Visual diff with the baseline highlighting changes.
- Guaranteed correctness of layouts and rendered user interface.
- Fully web based.
- Hours to automate testing of 5 screens.

In conclusion, I'd like to say that there is the great innovation progress in this sphere, and developers are improving it every day.

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INTERNET OF THINGS

Maxym Bulgar

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, everybody knows about Internet of Things. This trend is now gaining more and more popularity. The potential use of IoT object are many and varied, they spread to virtually all areas of everyday life of people, businesses and society as a whole. The International Energy Research Center identifies and describes the main applications of Internet of Things, which cover numerous fields of application: intelligent power generation, smart health, smart buildings, intelligent transportation systems, intelligent industry, intelligent city.

But what is the Internet of Things?

Internet of Things is a network of physical objects (things) that have embedded sensors and software that allows you to exchange information with minimum human intervention. It is considered that in the future "thing" will become active participants in the information and business processes, where they will interact with each other, share information about the environment, and according to this information affect different processes without human influence.

Internet of Things are very important in many industries. For example, smart buildings (smoke detectors, sensor flow tubes, energy saving, health), industry (improving the efficiency of work, eliminating the risk of human error), medicine (remote monitoring of patient, efficiency of treatment, motivation for a healthy lifestyle), agriculture (automatic watering, maintaining a climate).

But as the Internet of Things is a fairly new concept, there are some problems that prevent to develop. The first problem is unclear standards. Since this concept is based on the relationship of things is very important to ease the interaction between them that is not possible without clear standards. Another barrier to the development of IOT is security. Insufficient security appliance can lead to terrible consequences: home security system, traffic control and so on. The third issue is the autonomy of systems and reduction of their energy consumption, since most systems have different wireless sensors are set, and the provision of electricity can be a problem. And you can not forget the psychological aspect. If a person is not one hundred percent sure of safety, it is unlikely to use technology that can cause danger to life.

Summing up, we can see that today IOT occupies an important role in society and its development is gaining momentum. Internet of things technology has unlimited potential. Eventually things that surround us turn into an information system that will improve our lives and this is an important technical revolution. But first of all depends on the problems that currently exist, because they are a significant barrier to development.

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BENEFITS AND CHALLENGES OF BIG DATA

Volodymyr Danchul
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Almost everybody heard this word, but do you really know what it means? Someone may say that it's just a trendy phrase with no background behind it. The 2014 IDG Enterprise Big Data research report showed that almost 48% of big and medium American companies are already implementing or planning to implement in the nearest future a big data analysis. It's easy to predict the fast development and large investments in this direction. Usage of big data researches is going to spread over the all fields of economy, sociology, customer servicing and others. Many graduates of IT faculties will be involved in this process. That is why it is necessary to understand what the big data is and why it is so important.

Big data is an enormous amount of data, which can be used to found some interesting dependences and build flexible queries, that can't be processed using the traditional methods and applications. To simplify – big data is a set of techniques and methods used to work with unrelated and polytypic information.

Why we can't just use the standard relation data bases and scale them for our needs? The main problem is that the relation DBs store date in structured tables. It is good for simple queries, but when we will need to perform some complicated joins the performance issues will arise. The main point of big data approach is to store any unrelated data even gathered in real-time and find some useful tendencies by applying some data mining algorithms. For example, we need to find out mobile phone users which want to buy a new phone instead of the own outdated one. We are gathering call statistics, billing data, internet usage, and geolocation and so on. Then we define a threshold criteria – using some services, high internet traffic consuming combined with the outmoded mobile. After this we can send SMS-messages to every potential client when he will be near our shop. The important thing is that we can complicate our task and also find out the most popular models which such people are choosing and use it in future advertisements. So what do we have in the end? An unstructured massive of data which can be easily analyzed, we can add more hardware resources if we have such a need, the data mining process can be paralleled for better performance.

Big data methods are used for very complicated, irregular and unordinary problems. There is no point in building a new system for something which can be handled by the relational database in a proper time.

Another good example in the marketing field is a product placement problem. In USA and Western Europe it is a widespread task. We have a massive of checks with all kinds of products for several years. After the analysis some association rules will be found. One of the most obvious is that beer is often bought with snacks. But if we go deeper, we will find a strange association between beer and diapers. This fact was discovered by American researchers. The explanation is simple – people who have little children can't go out with friends as often as they want, but they want to have some rest. So they are buying some alcohol when going to weekend shopping.

Improving the product placement in this very case was significant for sales. Also, it can be used to generate profitable and stimulating discounts. There is a lack of such implementations in Ukrainian marketing which should be improved in the nearest future. Big data is the third generation of analysis. It combines descriptive, the one which describes past, normative, the one which tell us what to do now, and predictive approaches. The last one is the most valuable.

Just imagine if we would be able to predict people illnesses, automatically receive information about the needed country in the airport or simply believe in meteo forecasts without any fears. The benefits of big data usage are attainable, logical and can improve every sphere of life.

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FUNCTIONAL PROGRAMMING IN WEB DEVELOPMENT

Andrii Datsenko, Yevhenii Kyselov
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Modern web development changed the game a lot in terms of its architecture, bundling, deployment and testing. But still have same stuff to handle user interactions and back-end communication, which is asynchronous and keeps UI updates process complicated and fragile. Common programming paradigm in web development scope is object oriented one, which has its pros and cons, but what if it can be replaced with functional one?

In last few years there been a lot of investigation and new tools in web, which mostly adopt functional paradigm and promotes it on each corner. Let's take JavaScript into review as it is main web based scripting language that is made with strong functional programming. It supports closures which implements encapsulation and privacy, pure functions without any side effects, higher order functions that can return functions and accept them as arguments, carrying, immutability, etc. Additionally JavaScript has lots of supersets, libraries or other languages that compiles into it, like Elm or LiveScript. Functional programming can bring a lot into web and reduce complications in application state manipulation and event handling.

Main target of this study is to investigate how to involve functional style into web development process and build reliable, error prone applications that seamlessly scale. The main point is JavaScript is highly vulnerable at runtime due to no type checks and unexpected user behaviour or another scripts penetration and thus proper tool could solve this problem.

The results of research showed that next tools exist and provides lots of useful and error prone approaches and codebase: Elm, Closurescript, Immutable.js and ramda. Some great projects are already done via those libraries and compiled languages.

It was found that functional programming could be applied in web development process and environment. It can increase reliability and flexibility of code, reduce runtime errors and give full control over application state and data management.

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INFORMATION SECURITY IN INDUSTRIAL CONTROL SYSTEMS ON CRITICAL INFRASTRUCTURE OBJECTS

Andrii Davydiuk

Institute of Special Communications and Information Security,
NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Industrial control systems in recent years have achieved a new level due to development of information technology and the Internet. However, a new round of automation brings problems: the improper use of data processing and protection technology is the reason for serious vulnerabilities.

Consequently, industrial control systems more often become a target for malefactors and cyberarmy. Instead of individual worms Stuxnet (2010) and Flame (2012) came to more sophisticated schemes multistage attacks.

So, to spread Trojan Havex in 2014 hackers hacked sites of management software industry manufacturers to control industrial enterprises from the system of supervisory control and data acquisition (SCADA) and infected the official distribution SCADA-systems, which are then were installed in enterprises allowing attackers to gain control of management systems in several European countries.

Industrial Control System (ICS) − is a general concept that is used to describe several types of control systems, including the system of supervisory control and data acquisition (SCADA), distributed control systems (DCS) and other management systems (PLC), which can be found in industrial sectors of critical infrastructure.

SCADA-systems are distributed systems used for managing geographically dispersed assets, which are often located on the area of thousands of square kilometers, while centralized management and data collection are required for critical work. DCS-system created in such a way that the architecture of governance consists of management, which monitors the multitude of integrated subsystems responsible for details of local production processes.

PLC-controllers are computer devices that control industrial processes and equipment. Many distribution systems that control the production, transport, water and energy supplies can be found in the Internet using popular search engines. In January 2015, researchers of Positive Technologies discovered more than 140 000 different components of the technological processes automated control

system (ACS). And the owners of these systems do not realize how vulnerable they are. It is possible to identify opportunities to attack ACS through the kiosk mode, cloud services, sensors and physical ports industrial Wi-Fi and other types of accesses, which are often not considered to be a threat.

For effective protection the security strategy should provide records of all activities at individual level not associated with the configuration of the devices SCADA, since they can be broken during in the invasion. This approach should be accompanied by the elaboration of SCADA devices acceptable behavior principles with a clear definition of what is acceptable and what should be considered suspicious. In addition to these measures, the strategy should include automatic notification and prevention of deviation from the rules that will apply more effective measures against unwanted activities.

Thus, to achieve the desired level of protection for industrial and mission-critical networks, we need to move from individual set of technologies and practices usage to efficient business processes. An effective security strategy should detect atypical activity and prevent attacks, while giving organizations sufficient expertise to investigate incidents when they occur.

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SMART CHATBOT

Svitlana Dediuk, Oleksiy Bulakh
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Chatbot – a program to simulate conversation, based on pre-made templates. But a chat bot can be created not on the basis of manual filling the template, but using neural network training with examples of dialogues. Normal chat bot limited superficial responses that are defined by templates, but chatbot, which taught seeking

answers to similar questions in its database dialogue, sometimes even can create new patterns, but the ability to learn this "mind" is top-limited to algorithm complexity. Bot with neural network operates on the principle of "question on input – output response" and theoretically is not limited. There are also bots that have shown that neural networks can learn the rules of inference, if they get the input natural language sentence and answer questions concerning the various texts.

If as input to the dialogue is 3000 replica, you can assemble a simple bot that picks up the ready response of dialogue based on the coincidence of words in phrases interlocutor (cosine of the angle between the vectors questions and answers). The classic way to generate text using neural networks is neural models of language (NLM). The essence of the model: neural network is expected early next word based on the n-previous. Word of the output encoded on the principle of one output neuron – one word. Input words are coded in the same way or using distributed representations of words in a vector space where close related words are on the smaller distance than words with different meanings. The trained neural network can give rise to and receive text prediction graduation – so you can create the model answers. The input can be submitted prior representation phrase dialogue. The easiest option is to use the vector sum of all the words of the previous sentence. Recursive layer receives the input data for the current word vector representing the previous sentence, as well as their own state in the previous step (as it is called recurrent). Due to this neural network theory can remember about the previous words in an unlimited length phrases (as opposed to the sale, which takes into account only the words from the window of fixed size).The correct selection of the learning algorithm and network settings can achieve good results, but they will have a problem: the repetition of phrases, difficulties with the choice of place finish proposal will copy long excerpts from the original training set, the network is difficult to analyze.

If you combine convolutional recurrent network model language, you can get convolutional layer containing 16 filters. From general considerations can be expected that this model study of four layers is complicated and the result will be worse. In addition, the filter 16 is clearly insufficient to create a model replica interlocutor. Its training takes more time, but you can review what has been learned by tracing the dependence of activation of neurons in the input layer phrases. Through this analysis could detect neuron that responds to greetings ("hello", "hi", "he" y and t. P.) and neuron that detects interrogative phrases like "have you ...?" – this question mark is not mandatory (they learned neural network typically answers "yes"), except if the issue appears the word "you" ("you"), the probability that the response will begin with the words "I" ("I").

Thus, neural network learned some typical patterns of conversation and language tricks that are often used in "manually" programming of chatbots good organized with available 16th filters. It is possible that replacing simple convolutional network for multi-adding filters and increasing the amount of training set, you can create chatbots that will seem more "intelligent" than their counterparts based on a manual selection of templates.

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THE CRYPTOGRAPHIC METHOD OF INFORMATION PROTECTION: ESSENCE AND THE PROBLEMS OF USING

Maksym Demydenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, the much attention is given to the problem of information security, ensuring the protection of confidential information from acquaintance with it by the rival groups. These are the following concepts: state secrets, military secrets, trade secrets, banking secrets, medical secrets. According to increasing significance and value of information, the importance of it's protection is growing up.

All the problems, arising from the security of information while working in computer networks, can be divided into three main types:

Interception of information – integrity of information is preserved, but its privacy violated;

Modification of information – the original message is changed or completely replaced by another one and sent to the recipient;

The problems of information security are examined by A.V. Domashev, N.N. Hruntovych, V.O. Popov, V.Y. Kuzminov, V.I. Nechaev and other scientists.

The purpose of this research is to analyze the cryptographic method of information protection.

Among the range of methods to protect data from unauthorized access special place is taken by the cryptographic algorithms. They rely only on properties of the information and don't use the properties of its material carriers, features knots of its processing, transmission and storage. Figuratively speaking, the cryptographic methods build the barrier between information which is protected and the actual and potential attacker with the information itself.

The task of cryptography is reversible transformation of a clear source text (plaintext) into apparent random sequence of certain characters. Encryption is based on two basic concepts: algorithm and key. Algorithm – is a way to encode the source an encrypted message, as a result we have an encrypted message. The encrypted message can only be interpreted with the key.

The basic areas of using cryptographic algorithms are: confidential transmission of communications (ex., e-mail), authentication of posts, storage of information (documents, databases) on carriers in the ciphered kind.

Currently designed the great number of different encryption methods, created theoretical and practical bases of their application. The majority of these methods can be successfully used for closure information. The elementary methods are: applying substitution (Caesar Cipher), monoalphabet cipher, multialphabet cipher (Playfair Cipher, Hill Cipher), polialphabet cipher, Wheatstone Cipher "Double square", application of permutations (application of of magic squares), XOR cipher.

The problems of using the cryptographic techniques in information systems is particularly relevant now. The emergence of new powerful computers, network computing technologies and neural computing technologies made possible discrediting of cryptographic systems that have recently been considered impossible to disclosure.

Another important issue is the contradiction between the desire of users to protect their information and messaging and request of specific public services to have access to the information some other organizations and individuals to stop illegal activities. In developed countries there is a wide range of views on the regulation of using encryption algorithms in the laws. Expressed offers to comprehensive ban of using the cryptographic techniques and also there are offers for installation complete freedom to use it. How to estimate the value of losses of individuals and organizations from the illegal using of their information and how to assess the state damages of inability to access to encrypted information certain groups that hide their illegal activities?

As a result of the research the following conclusions can be:

The problems, arising from the security of information while working in computer networks are: interception of information – integrity of information is preserved, but its privacy violated; modification of information – the original message is changed or completely replaced by another one and sent to the recipient; substitution of authorship of information.

Among the range of methods to protect data from unauthorized access special place is taken by the cryptographic algorithms that build the barrier between information which is protected and the actual and potential attacker with the information itself.

Currently designed the great number of different encryption methods, created theoretical and practical bases of their application and the problems of using the cryptographic techniques in information systems is particularly relevant now. The emergence of new powerful computers, network computing technologies and neural computing technologies made possible discrediting of cryptographic systems that have recently been considered impossible to disclosure. The contradiction between the desire of users to protect their information and messaging and request of specific public services to have access to the information some other organizations and individuals to stop illegal activities. The above issues require further investigation and resolution both the theoretical and practical level.

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PERSISTENT DATA STRUCTURE

Mariia Digtiar, Olexander Russin
Faculty of Informatics and Computer Science, NTUU “Igor Sikorsky Kyiv Polytechnic Institute”

A persistent structure is a type of data structures that allows access to all of its modified versions of the structure. The practical application of such systems is

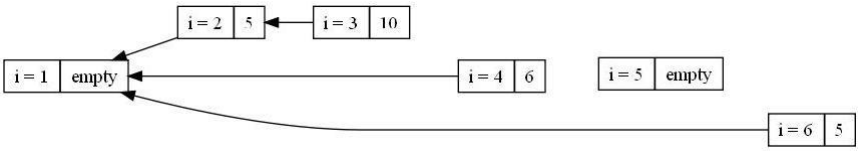
important when you make changes to the database. The hardware and software can failure because the data may be lost. Thanks to the stored data a "roll back" of the time of the crash can be made, which largely ensures the data structure is implemented.

The basic methods of persistent structure are the method of copying the path, and a full copy method of thick knots. The problem arises is that such a decision takes too much time. It is also extremely costly in memory. There is a copy of all data. Full copy of data in practice is not actually used. It might be used only in the testing stage as part of more complex system. It is necessary to develop a framework to optimize and reduce the use of resources for this process. As mentioned above, a complete copy is ineffective.

Data structures can be of two types: ephemeral and persistent. Ephemeral is a type of data structures that saves only its latest version of change. Unlikely former type the persistent structure keeps all the wood changes that are made.

Persistent data structures can be divided into two types: those that allow its latest version to be only edited. This is called partially persistent. The full is called persistent structure that allows you to make changes to any version.

Actual optimization method is to copy the path of asymptotic O (log (t) and the method of copying thick nodes O (log (n)), where n – number of changes in the structure.



Besides all you can simulate using two stacks. Theoretically you can do two stacks to solve persistent problems. But this simulation operation is asymptotic O (1) if a pop stack from which we receive the items appears to be empty then we translate it in all the other elements of the stack. In the case of an ordinary turn each item is translated only once, so the total asymptotic behavior is O (n), but a persistent case of each item can belong to many queues and therefore can be translated several times.

A persistent stack can be arranged in such a way that each element stores a pointer to the element that lies below it, for each stage, except the signs at the beginning and the end. A pointer to the element list will be saved and a pointer to the item that is based on the list (if we do not build, it will be equal to 0) and we can calculate the value for the new stage (obtained after applying to the original push or pop).

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BOTS, THE NEXT FRONTIER OF MESSENGERS

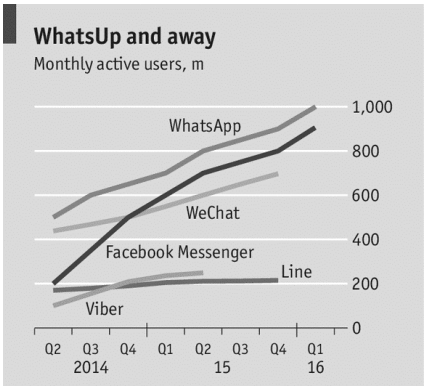
Dmitriy Dovgal

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Over 2.6 billion people have one, or more messaging apps, installed on their smartphone or tablet. Many teenagers spend a lot of time on communication via the

Internet, sending short messages, which indicates the demand for messengers. Under the influence of this popularity, some messengers have decided to offer innovation in the form of automated programs, which do not differ from normal users and contacting to people by means of a chat.

So, as a result, many companies started to develop their own bot platforms. A new messaging ecosystem has started to emerge. Messaging services have been since the dawn of the Internet time, but the birth of the bot's era was after Telegram launched their own bot platform and "bot store". Now, the number of bots to only one Telegram platform exceeds a few thousand. The number of bots for Facebook Messenger is much more – hundreds of thousands. The most popular are news bots sending out articles on specific topics, bots for the weather forecast, alerters and reminders.



Bot is a program that runs on a server, processes requests and gives the necessary information to the user-interlocutor. Now, there are several bot platforms for different messengers: Facebook, Telegram, Slack, Skype. While backend (program part) is a program on the server, front-end (means of interaction with the user) is the messenger working directly. It allows to avoid difficulties of use and to simplify the procedure of interaction to a minimum.

Currently, the bot platform is supported by many companies. Starting from specialized services (Github, Aliexpress) and ending with the banks (Privatbank). And apart from it, there is an uncountable number of the user's bots. All this testifies to the fact that consumers have embraced the concept of bots painlessly and made them an important part of messengers.

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NEURO-COMPUTER INTERFACE FOR THE DISABLED

Kateryna Dubok
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Mechanisms which can manipulate electronic devices with "power of thought" seem to be fantastic for the most of people in our world. Although it's much more simple. In this article the analysis of new environment perception was provided for not only health people, but also for the disabled.

Studies about communication between electronic devices and human brain have been conducted since 1970. Recently a neuro-computer interface has provided one-way or two-way communication between the brains. This mechanism is innovation in science, thus it has a lot of applications.

Based on these mechanism devices that allow the user to restore eyes function, hearing and lost movement skills were developed. A prosthesis that has high sensitivity, simulates the retina and restores sight by using an electronic implant enabling paralyzed people to control sight by a cursor on the desktop app was developed. This will extremely improve the quality of life for people suffering from various diseases. And it can provide new opportunities for ordinary people.

The neuro-computer interface can be invasive. The microcontroller is implanted in human brain that perceives electrical signals coming from neurons in the brain during data transmission. A mechanism may be non-invasive; in this case a human head is fixed by electroencephalographic electrode that records brain responses to various external influences. Then these signals are transmitted through the electrodes to the neuro-computer interface, which can perform some actions according to specified signal value. Non-invasive mechanism is safe for humans. However, in future invasive mechanism will be the most popular among people.

But innovations have some limitations. Has humanity mind prepared for the body modifications? They will wear mechanisms with artificial intelligence that is able to cause restriction of their freedom.

Thus, according to analysis of innovative technologies such as neuro-computer interface, we can definitely say that it will become an integral part of our future and improve the quality of life for people with disabilities.

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EVALUATION OF EFFECTS OF NON-ATOMIC MEMORY DUMP FOR FORENSICS

Oleksii Fedorov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Memory forensics is a forensic analysis of a computer's memory dump. It is generally used for analysing stealthy attacks when there are no artefacts left on a hard drive or to recover other valuable artefacts for investigation, such as network activity, process activity, opened files, encryption keys (which exist only in volatile memory), etc.

Memory acquisition involves copying the contents of volatile memory to non-volatile storage. It is one of the most important steps in the memory forensics process. If something will go wrong with memory acquisition method, memory dump may and up corrupted and useless for analysis.

Modern operating systems are using such mechanism as virtual memory. It works by giving each process its own continuous memory address space. And virtual

address spaces and the assignment of real physical memory to virtual memory are done by the operating system. From the point of view of memory dump it leads to a high sparsity of pages for each process.

Memory can be acquired from the running system by using different methods [1], which can have its own advantages or disadvantages. Some of them are: dump from hypervisor, hibernation file, crash dump, dump from inside of operating system, hardware acquisition.

In my work I focused on the acquisition of volatile memory of a running system by using a kernel extension as it is the one of the most commonly accessible ways of acquiring memory in general forensic investigation process. The memory image produced that way may have internal inconsistencies due to the fact that memory dump takes time, during which running system will modify some parts of its memory.

Such inconsistencies in software-based memory acquisition methods was described in [2], and further formalized into one of the properties of memory dump called "atomicity". It is defined in work as [3]:

A snapshot is atomic with respect to R if the corresponding cut is consistent. Likewise, a snapshot is atomic with respect to a subset of memory regions $R \subset R$ if the corresponding cut through the partial space – time diagram is consistent.

Atomic memory dump is such a dump that did not changed during acquisition process, and reflect perfectly still system snapshot at certain point in time without any signs of concurrent activity.

It can be memory dump created by pausing the VM execution and taking a memory snapshot, or memory dump from hibernation file, etc. It is the best method for forensic analysis, but it needs a specific preparations or conditions (running on a VM, access to a hardware, etc).

Non-atomic memory dump is a memory dump which created during a certain time frame within a running system. Acquisition time will depend on system memory size, writing speed for a destination non-volatile storage, plus overhead of acquisition software. In this case there can be inconsistency in memory dump, as some memory pages might change during the acquisition process.

The main idea behind my research is to analyze and measure the impact of non-atomicity in memory acquisition process by comparing non-atomic memory dumps to their atomic counterpart. Such dumps must have minimal time difference between the start of acquisition to be feasible for comparison.

To achieve this, first atomic snapshot of a virtual machine needs to be made, which will be the base for comparison. Then, as soon as VM continues execution, it must start software-based non-atomic memory acquisition. During non-atomic memory acquisition we need to record starting and ending time, and also timestamp acquired memory pages. That way it will be possible to tweak forensic analysis tools compare non-atomic memory dump against atomic counterpart to study the effects of non-atomicity. The main interest for this comparison is the data which can be very volatile and / or very important for forensics. For example, it may be the stack region of processes, heap region of processes, or various kernel structures that are linked with another kernel structures.

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PROGRAMMS REPLACE PROGRAMMERS

Oleksiy Filyayushkin

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, IT-specialists are extremely valuable. Information technologies grow fast and take more and more place in every part of our life. Robots replace humans at the facilities. Will machines perform all the hardest work instead of their creators? – May be. Be sure, they will never fully claim our workplaces, because every machine requires technical specialists to perform adequately. Moreover, programmers, who create software for soulless automatons are almost gods. However, their time will come to end one day…

Modern software is advanced enough to perform multiple operations simultaneously with high speed and precision. In addition, such intelligent system as neural network-based search engine is capable of searching various data by user command. There is no doubt, that further progress in IT-sphere will create special sort of software, who generate… a program code! Machines making machines… What an abomination!

Another interesting variation of such software commonly used nowadays. They are like a constructor that reminds us visual redactor for software's graphical user interface. There you can operate with different logic elements that can be set by your needs by selection of properties with minimum of work. Software created in such programs is quite simple, even primitive but for some purposes, such method of development is useful.

Some elements have already been used in developers' kit. For example, reminded earlier GUI redactor where programmer can place elements (buttons, labels, field etc.) and set an interaction between them. This is far easier, than write their position with code and without any graphical view of situation that happens.

Before you start violently cry about an unemployment in programming and forward crisis, let me explain you one thing. Labor market will change according to the leading trends. Programmers will not write classic code anymore. Instead, they will take a lead in forming a request to such software alongside with required documentation.

Why? Even due to the expected software's capabilities in creating programs, such "code formers" are nothing more, than a database with methods, default classes etc. and code formation logic. Therefore, they need input information such as instructions, restrictions, requirements and following documentation. However, who knows how such theoretical software will evolve in nearest future.

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A REVOLUTION IN THE NON-VOLATILE MEMORY

Yaroslav Galchenko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Variety of applicable devices and digital services are producing colossal volumes of data. For being useful, this data must be processed at a short time. There are a lot of new technologies in the area of memory, such as memristors, phase-change memory, memory driven-computing and others.

But there is a technology which stands out from the crowd. It is called 3D XPoint. It is faster and more capable than other inventions in this field. For instance, it can achieve 1000 times greater throughput and it can work 1000 times longer than NAND Flash. It provides 10 times more capacity than DRAM. Multi-layering architecture enables storing 16 GB per one crystal using two layers of memory. Future generations of this memory will increase the number of layers to scale capacity. This memory retains data when the electricity is absent, unlike RAM. 3D XPoint also has low power consumption and affordable price.

3D XPoint is joint development of Intel and Micron, which works differently from NAND Flash. The basis of this technology is cutting memory material into columns, which contains cell with one bit of information and selector. Storing bits works by changing the properties of the memory material. Each memory cell has high or low resistance, high resistance represents one and low resistance represents zero. Columns (cell and selector) are united with wires at the top and bottom of sheet where columns are placed. These sheets with memory columns can be combined three-dimensionally. Each cell can be selected individually by creating certain voltage at the intersection of wires. This causes acceleration in read/writes processes. 3D XPoint module can work for very long time, despite of read/write cycles, because this technology does not use transistors.

This technology can change current memory architecture of PCs. Computer has many layers of memory: CPU registers, cache, DRAM, hard drive or solid state device. Each subsequent layer is slower than the previous. So, reading data from the hard disk will adversely affect on computer's performance, because hard disk is the slowest memory device. But 3D Xpoint can change this architecture, its storage can substitude these all layers for only one layer – high-speed pool and so data will be closer to the CPU.

There are many variants of use of this technology. First of all, it is suitable for SSD storages and DIMMs. Now Intel developed such products under the trademark Intel Optane. New Intel Optane DIMMs for Intel data-centers platforms and fast SSDs will go on sale in 2016. This memory can be used as a high-speed pool of storage and system memory. Different online gaming companies want to use 3D XPoint instead of RAM modules, because quantity of players is restricted by the amount of RAM on gaming server and 3D XPoint DIMMs provide huge capacity. Advantages of 3D XPoint's high speed processing can also be estimated by usual PC users. For example, when AutoDesk cashes 400 GB file, it takes 15 hours. With 3D XPoint it will be much faster, about in thousands times.

In conclusion, it is a revolution that we had been waiting for. There are more and more data in the world and so it is too hard to extract meaning value from this heap. But 3D XPoint provides very fast data handling, which will speed up servers and computers in many times. This gives many exiting capabilities in many fields from gaming and pattern recognition to genomics and neural networks. Science will walk forward with this invention. I can confidently say that this memory is close to an ideal memory and it will change the world.

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THE FUTURE OF DRONES

Viktor Garkusha

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

We live in time of a technological progress. Every day we can see new discoveries in different part of technologies and science. Every day humanity solves different problems to do our life easier, safer and more interesting. We live in a time of robots and automatic machines.

Unfortunately people always do the same mistakes as earlier generation, for example different wars, deforestation and so one that entail death of people and different animals, also the death of our nature. Fortunately humanity has a solution – Drones. Drone is an unnamed aerial vehicle that originally was made for military for intelligence service. The main task of these drones is different special operations that can be very dangerous for human. They can be use in many different ways such as intelligence of some enemy territory, protection of reassigned territory or implementation of some dangerous operations. So the soldier mustn't venture his life for hazardous missions that the drone can do. Of course it's very expensive, but in my opinion there are no more valuable, that people's life. Nowadays a lot of companies produce drones both for military and civilian. Everyone can buy drone for his own need. For example you can by a drone for your child, it will be a perfect gift, it can be used as a toy or for researching to develop mind.

In future drones will be used nearly in all fields of activity. The farmer can use drones, for example they can watering the garden, scare the birds, to do this things drones must have appropriate program. They also can be used as carriers, for example you need to deliver some goods to the place that is very difficult to reach as some mountains or far places in the forest. Drones are often involved as a camera to make a movie or some clips; it is very comfortable, because a human can't do the same photo or video.

So we can do a conclusion that drones are very necessary in some fields of activity and in the future they will be very popular and even may replace human in some areas of work.

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DJANGO IN WEB DEVELOPMENT

Andrew Gavrilets
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Planning and implementing of websites is always accompanied by great efforts. Django represents one of the best of the actual frameworks, which allows quick development of high-performance and full-functional sites. With the help of Django it is easy to build easily scalable and extendable Web applications of any difficulty [1].

By abstracting from low-level Web-building process, Django allows developers to create dynamic, database based Web-sites quickly. One of the main benefits of Django is the portability of created products due to it basis' portability, which is a high-level programming language Python.

Django is pronounced softly, without an audible "d", as in "jan-go" [1].

Django includes ModelViewController (MVC) – an instrument that allows the partition of main architecture into separate parts. At the same time, the control flow is

divided into three separate components so that the modification of one component would have minimal influence on the other parts. Such components include shareable data, program logic and viewlayers. In a common case that concept allows to divide the development of informational content at the database and Web-page development level [1]. Django is based on a Python classs django.db.models. Model defines given models in a way so that they could be used on Web-sites. That data is determined by associated object attributes, which are saved in the database during the work process. While creating a site, a subclass of a Model class is created and a set up of components is added into the class to define specific data [2].

The model interface of Django provides multiplane options out of all available model types in order to pick the one most suitable in given situation. Chosen project model synchronizes with functioning database, where its data is saved in tables. Django actually provides a good database interface, which allows to acquire secured access to the information from viewlayers and patterns. The content display changing based on the received URL-request is a multistage process. When Django-server receives URL-request, he parses it using previously set pattern instructions, defines which part of the code will be executed for required display pattern.

Pattern parser in Django allows to manually tune its patterns, which use Web-page display functions while building the response to URL-requests. It allows Python developers to focus on creating of the data that will be displayed, and HTML programmers – to focus on Web-page design [2].

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NEURAL NETWORKS TODAY

Maxim Gencha

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Artificial neural networks have become part of our lives and now widely used for solving a variety of problems and actively used in applications where conventional algorithmic solutions are ineffective or even impossible. The tasks which rely on artificial neural networks are recognition of texts, gambling, contextual advertising on the Internet, spam filtering, inspection of suspicious transactions on bank cards, security systems and video surveillance – and that's not all.

Neural network sand brain

Artificial neural networks, like biological, is a computer system with many parallel operating processors with a lot of simple links. Despite the fact that the construction of such networks normally makes a number of assumptions and significant simplifications that distinguish them from their biological analogs, artificial neural networks show a surprising number of properties inherent in the brain – is learning from experience, generalization, extracting relevant data from the redundant information.

Today there are a large number of different neural network configurations with different principles of operation that focused on solving a variety of problems. As an example, consider a full mesh multi-layer neural network of direct distribution, which is widely used to search for patterns and classification of images. Neural network is a full mesh layer structure, wherein each layer of an arbitrary neuron is connected with all neurons in the preceding layer.

Training

The ability to learn is the main feature of the brain. For artificial neural networks for learning refers to the process setting the network architecture (structure of connections between neurons) and the weights of synaptic connections (factors affecting the signals) to effectively solve the problem. Usually trained neural network is carried out on a sample.

There are three learning paradigms: the teacher, self-learning and blended. In the first method, known correct answers to each input example, a weight adjusted to minimize the error.

Using

Neural network software packages developed by several companies, allow users to work with different types of neural networks and with different ways of learning. They may be specialized (e.g., prediction of the stock price), and versatile enough.

Applications of neural networks are very diverse – this text recognition and speech, semantic search, expert systems and decision support systems, prediction of stock prices, security, analysis of texts.

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WHAT ARE GRABBER AND PARSER?

Alexander Getmanenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In recent years grabbers and parsers have become one of the interesting areas of web. The purpose of using them is simply to receive information from other sites.

In terms of web development grabber is a specialized script that allows you to "extort" information from other sites to your own. Unlike grabbers, parser is able to recognize information in a pile of "garbage" and treat it in accordance with the task. Nowadays both terms are used interchangeably.

Why do we need grabbers and parsers?

1. To maintain the relevance of the information.

For example, it is very important for users of your site to know the current exchange rate. Changing the course manually is usually inconvenient, because it requires daily attention to the web resource. But what can be done if the information changes too quickly and irregularly? If it is important for you to have the most relevant information on your site and at the same time not to be forced to constantly update it, then the best solution is using a grabber script or parser.

2. For automatic pages update.

The site which consists rarely updated the information is rarely visited. The user who has already visited your website becomes simply uninterested. Such sites are called "dead" ones. But what can be done if you do not have time to update the information on the site? You can use the automatic addition of news, new articles on the subject of your site and other information from other resources on similar subjects with specialized scripts of news parser or content grabber.

3. Immediate website filling with useful information.

All network resources have once started "from scratch". However, if your site is aimed at providing information (link directory, abstract's archive, lyrics or chord database), then filling the site from scratch by hand is a long and laborious process. Parsers and grabbers (for example, links grabber) is the perfect solution to such problems. Their usage will allow you to quickly catch up with competitors and significantly expand your directory of information.

4. Integration (unification, centralization) of information.

There are a huge number of pages with important information for the user on the Internet, the main drawback of which is its fragmentation. Using site content grabber scripts, you can combine all the useful information by placing it on the same page. It is very handy when all the information from different sites is combined into one.

The basis of any grabber or parser is a regular expression. Regular expression is a template string designed to search, sample and replace the text that matches its pattern. The art of grabber usage lies in the ability to create a text template correctly. Also, regular expressions are an indispensable tool for cleaning the information received from the user. Given that a regular expression is the language of text description, a well-formed template must match where it is needed and must not match with anything else.

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LOW Z-WAVE WIRELESS TECHNOLOGY FOR THE INTERNET OF THINGS

Kristina Goloshchapova
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Information technology plays an important role in the modern world. Obviously, the Internet has become one of the most important inventions in human history. The new stage of the Internet development, which greatly expanded the collection, analysis and data transmission, is the Internet of things development concept. This is nothing new, as this idea has been discussed at high-tech companies and by experts in this field for a long time.

Faced with the world of the Internet of things, great attention is paid to a wireless connection as an important element of home automation. "Communication" and data transmission between the air conditioning, a refrigerator and a control panel that controls home appliances, are most often done through Wi-Fi technology or Bluetooth. They have disadvantages which affect negatively the work and are unnecessary for home automation. This is, firstly, overload 2.4 GHz band, which leads to interference in the network and, secondly, the high energy consumption.

One solution to these problems is to develop reliable low Z-Wave wireless communications technology for home automation which is designed for remote control. Unlike Wi-Fi and other technologies of data transmission, Z-Wave operates in the frequency range up to 1 GHz and plays simple transfer of control commands, such as to turn on lights, open the blinds or turn off the music, with minimal delays. Choosing low frequency interference has led to a reduction in the network, because the number of potential sources of interference is negligible, and to reducing power consumption.

Z-Wave technology is based on the Mesh network. So each device, which includes a chip Z-Wave, can transmit and receive control signals via a wireless radio frequency network. The devices operated by this technology are autonomous and independent of each other and when any device fails, the others will function.

Another feature of the Z-Wave is that connection to an outside of the network is almost impossible. To control devices, this technology uses the main controller, which is a gateway TCP/IP. For example, if the phone sends some command, HTTP-request is sent via Wi-Fi to the main controller. In the next step, using circuit board Z-Wave, the controller sends a Z-Wave command endpoints, i.e. the device.

Thus, Z-Wave has many advantages that ensure reliability, scalability and expansion at any time with new devices, and remote monitoring (via the Internet or mobile phone). This technology is an interesting solution to the problems highlighted in this article, but because the Z-Wave operates at low frequencies there is a low data rate, excluding the transmission of images, sound and some other types of data. It means that transmission of data streams is limited and this problem requires further investigation.

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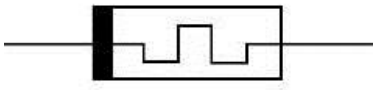
APPROACH TO BUILDING COMPUTER MEMORY SYSTEMS BASED ON MEMRISTORS

Olexander Goncharenko

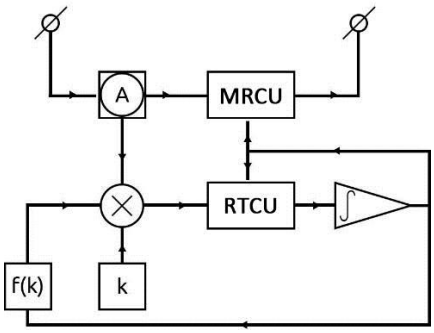
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Modern corporations are actively searching for innovative solutions to improve the performance of supercomputers, which must handle the ever-increasing amounts of information. In this paper we consider the invention that can change the modern computers – memory element based on memristor.

In 1971 year, professor of the University of California Leon Chua, created the theory of memristor. The name "memristor" comes from a combination of two words "memory" and "store". Memristor is a passive element in microelectronics capable to change its resistance depending on the charge that flows through it. Theoretically the storage elements, based on memristors, may be more dense and faster than the present Flash memory.



Pic.1.Designation of the memristor

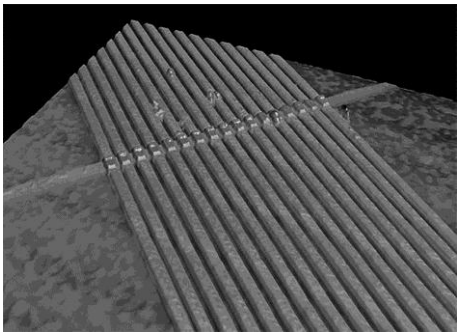


Pic. 2. Structural scheme of the memristor model

In 2008 year the first laboratory sample storage element that was showing some properties of memristor has been created by the Hewlett-Packard team of scientists led by R. Stanley Williams. The element is designed on the basis of chemical reactions in thin (5 nm) a two-layer film of titanium dioxide [1]. One of the layers of the film is depleted of oxygen and oxygen vacancies are migrating between layers under the influence of an applied voltage to the device. This memristor implementation should be classified as nano-ion devices [2]. In [3] the authors propose a model of circuit memristor as a memory cell.

The main blocks of the scheme are: the memristor current sensor (A), memristor resistance control unit, (MRCU), restriction thresholds control unit (RTCU).

Scientists from Trinity College Dublin created a memristor, which is capable of storing six states [4], in contrast to the memory on the basis of



Pic. 3. Memristors under an atomic-force microscope

transistors that stores only binary values. In modern memory (Flash or DRAM memory) bits are represented in the form of electric charge, memristors will store the data as the resistance (RRAM – Resistive RAM), because they have the ability to change their resistance depending on the current. Memristor's availability of "remembering" the charge will allow to create a non-volatile memory.

In 2014 HP corporation issued supercomputer project "The Machine" with a new computer architecture, a new operating system and new memristor based RAM that involves extremely high data rate.

According to Martin Fink, the head of the research department of the Hewlett-Packard, prototype of "The Machine" (2500 computing cores, 320 terabytes of main memory) will be presented in the end of 2016. However, instead of memristor memory, HP will use traditional DRAM chips, because work on the drives of the future is still far from the finish. Commercialization of the technology is expected in the 2020s. So, the memristor-based computers will have no restrictions of the modern DRAM and Flash memory, which will allow to design new over productive computing systems.

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ITIL AND AGILE IT METHODOLOGIES

Bogdan Grebenyuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

ITIL Methodology

ITIL is a library, describing the best ways of organizing work units or companies providing services in the field of information technology.

There is a perception that ITIL is a serious, difficult and confusing, that it is useful only for very big companies, and most employees in small companies keep everything in memory.

Adherence to ITIL principles helps first and foremost the Manager of a company of any size to work calmly, steadily, and planned. It's simple. The ITIL library has information about the best way to perform IT products. The opposite is true: it is possible to do it in the best way using ITIL recommendations.

It is noteworthy that IT companies are the same everywhere, it's different as they use ITIL, often without knowing about its existence. In fact, if the administrator does not work using his feet but uses his head, he will come step by step to what is

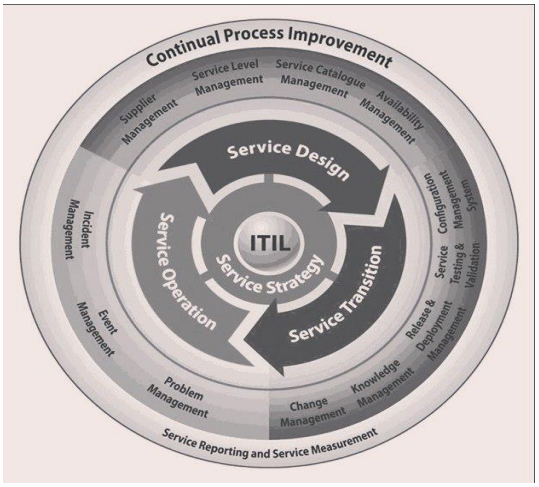
described in the ITIL on those issues. The difference between adherence to recommendations and self-invention consists in the value of the resulting experience (the number of erroneous experiments, wasted time and money). In addition, many processes and decisions do not reflect, because there is no need (incidents and requirements) of simulation.

Here are some basic examples of the most popular problems of administration in small companies:

1. Working with incidents and user requests usually takes most of the time, it is the least efficient (time / task), kills any planning, and brings chaos.
2. Changes (update, installation) in the IT infrastructure result in failure of everything, and victorious solution to the newfound problem in administrator's night shift unappreciated by anyone.
3. Change of administrator leads to new costs and downtime of it because the new admin doesn't know anything, looking uncomfortable reworks other people's crutches on his favorite crutches, and also does not write documentation.
4. Risks are discussed in quite an abstract form as "what if", "maybe", "well I told you so", "now works" – basic tags of such reasoning.
5. Backup and recovery procedures to be discussed at a maximum within a month after a serious failure, until the chief, will not see the price of it.
6. Administrators operate with the soul and conscience, all the better, but for some reason cannot establish high-quality operations and maintenance services.

Here is the diagram to illustrate the working process:

Using ITIL it is easy to organize services to clients, to earn more, grow more, save time, stress, nerves, not to quarrel with customers and employees, etc. Thus in ITIL, there is nothing new, and instead of the expected mountain of bureaucratic problems, there are possibilities for the optimization of processes. ITIL briefly and clearly describes the principles, the observance of which will help to ease the work and establish a desired job in IT company.



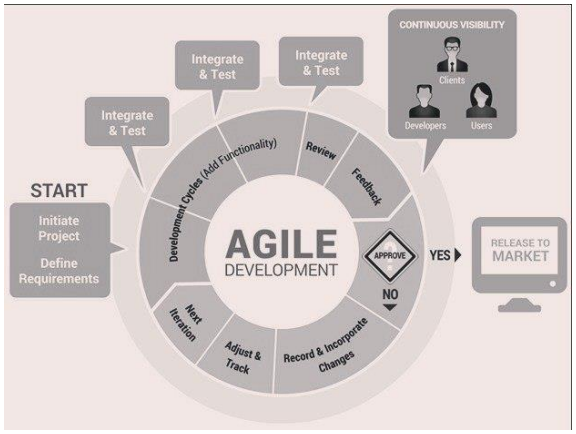
Options for the above examples:

1. A simple working Service Desk will help to solve problems with the incidents and the timing of their decisions. Analysis of incidents will help in understanding bottlenecks, which are usually are solved quite easily within small companies.
2. The use of a Change Management will allow getting rid of many problems because of trivial errors of stupidity, due to carelessness or ignorance.
3. Documenting the infrastructure is not as scary as it seems at first glance. Maintaining documents within a Change Management requires a lot of effort and saves a lot of time. Also, maintaining internal knowledge using a very simple wiki engine will save time in solving problems, or even provide a great opportunity for self-users.

4. Understanding of risks and their correct assessment is made to determine critical services, optimize infrastructure, find and fix bugs, etc., in the end, to get rid of a headache through the legitimate financing, or a full devolution of responsibilities to senior management.
5. Backup can be a simple automated procedure because everything is booked and planned, risks are identified, accidental breakage is minimized
6. Administrators are working quietly in scheduled hours, the customer / employer is satisfied.

AGILE Methodology

Agile means "alive, lively" or "flexible". In the industry of software development, this term appeared in the early 2000-ies, when "Manifesto for agile software development" appeared in the state of Utah. Since then, "agile" is a set of approaches to flexible software development.



Here is the illustration for the better understanding:

The essence of the agile approach outlined in the "Manifesto", but for the customer, it can be briefly formulated as follows:

1. The development is in short cycles (iterations), lasting 1-4 weeks;
2. At the end of each iteration, the customer gets an application (or part of it) that can be used in the business;
3. The development team collaborates with the Customer during the whole project;
4. Changes to the project are welcomed and quickly included in the work.

Currently, the agile principles are used in the work of tens of thousands of teams around the world.

In today's world, it is almost impossible to imagine using the traditional "hard" methodologies for the development of the project planned for 2-3 years ahead, because no one can predict what happens to the outside world (and, accordingly, with the requirements of the project etc.) during this time. There is also another problem – modern customers rarely know what exactly they want. But if the money for the project was found, usually everything has to be ready "yesterday". In this typical situation, the application of Agile allows to quickly start a project, reprises of the part already during its implementation.

In addition, Agile can be used in a variety of projects ranging from tiny student high-tech startups to major industrial projects. It is difficult to find another approach or methodology that would have such a breadth of applications.

It is important to note that individual developers' time have passed. Even if some brilliant programmer will create and release a wonderful program by himself, nothing will prevent competitors to organize a team that quickly implements a similar functionality. Effective team work on an IT project is vital, and we are talking about the teamwork as a unified, streamlined body, and not on the sum of efforts of self-employed participants. Agile allows organizing team work.

The modern IT professional are hardly impressed by a high salary, people want the work to be really interesting. Using agile the programmer who adds new functionality can immediately see it working in the app and the customer, which greatly improves motivation as the result of the work visible and used. Agile methodologies focus on teamwork, informal communication, low bureaucracy, constant changes make the process really exciting.

To summarize, Agile is:

1. Flexibility, adaptability, risk mitigation;
2. Scalability, breadth of applications;
3. Focus on effective teamwork;
4. Personal motivation for the participants.

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CRIMES IN INFORMATION TECHNOLOGY

Hanna Grigorets

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

During progress humanity are using, accumulating and handing over information. The society's continuous process of informatization covers all areas of human activity and the state, from solving problems of national security, public health, and transport control to education, finance and even just interpersonal communication.

Cybercrime is illegal actions, which are carried out by people using information technologies for criminal purposes. Among the main types of cybercrime

it highlights spreading malicious software, hacking passwords, stealing credit card numbers and other bank details, as well as the spreading of illegal information (slander, pornography) on the Internet.

The cybercrime history is the latest story that concerns all of us. Currently, the cybercrime problem has grown in scale of the global community.

Today, any users don't insure from cyberthreat, and information security issue becomes more relevant over time.

Not only in Ukraine, but in the world, the number of cyber crimes is growing steadily and their "quality" is constantly improving. Only after powerful cyberattacks people have started thinking about information security in Ukraine. Hacks and attacks have been earlier, but they had an amateurcharacter and were infrequent, and the country has faced with a powerful cyberopposition now.

The list of threats is just only constantly expanding, and the complexity becomes more perfect. Currently, there are not many single cyber hackers among the others, there are organized criminal structures which raise money purposefully coding and distributing malicious programs, and to confront them with just installed antivirus is problematic.

The situation with cybersecurity in Ukraine meets global trends – the number of crimes in this area is steadily growing. Ukraine is among the ten countries in both the number cyber attacks victims, and the number of their sources.

In 2015, 122 DDoS-attacks using botnets were committed in Ukraine, which exceeds the figure in 2014. Total in the world during this period there were more than 23 thousand of DDoS-attacks using botnets to resources 76 countries. China, the United States and Canada led the rating of the countries, which account for the largest number of DDoS-attacks. They are followed by Russia, Vietnam and South Korea. DDoS-attack brings the information system (for example, website) to a state in which users can not access it.

Consistently leading Ukraine and distributing spam. In this way, according to the analysis of spam "Kaspersky Lab", Ukraine is on the 7th place in the 2015 list of distributors of spam with the figure of 3.41 %. The first places in the ranking are occupied by the USA (14 %) and Russia (6.1 %).

Moreover, operating systems (OS), and anti-virus programs in most cases unlicensed that is security of information resource users are under constant threat.

The risk of cyber crime is characterized by two main indicators – prevalence and damage. In addition, the major problem is the very complexity of the calculation, the inability to assess, for example, consequential damages and losses from the theft of corporate information and other intangible assets.

Fighting cybercrime in Ukraine remains quite acute issue that stood in front of law enforcement officers and the public.

In Ukraine, the fight against cyber criminals involved in CERT – a specialized structural unit of the State Special Connection Service, Office of the fight against cybercrime (UBC), Ministry of Internal Affairs of Ukraine and a similar division of the Security Service, but their efforts to reduce cyber threats on a national scale is not enough.

Experts do not predict anything good in the field of information security – new

threats will become more serious and complex, break-in attempts will be bolder, further attacks will be subject to smartphone users and become more widespread targeted cyber attacks when targets are specific organizations or people.

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IMPLEMENTATION OF NEW COMMUNICATION STANDARDS

Valeria Her

The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

No one imagine modern life without communication service, phones, and the Internet. These information technologies help us in everyday life to find the right information, contact the person who can be anywhere in the world. It is difficult to find a place on Earth where no one would know about phones and their capabilities. Increasing of data rates is the main task for today, which is solved so many years because of the growing needs of mobile phone and the Internet users. Modern information technology must be available for consumers to conduct various operations without problems.

To solve this problem, world leaders in the field of information and communication technologies develop new communication standards. The latest standard, which has been embedded is 4G. Its advantages over previous standards are:

− the transfer of data to support the speed that is much greater than 100 Mbit / s for fixed subscribers is 1 Gbit /s;

− this standard supports IP-communication protocols;

− a weak correlation was reached between antennas placed close right through diversity transmitting and receiving antennas;

− 4G protocol based on other data transfer protocols, namely packet ones; -IPv4 is used in this standard to support data transfer.

Nowadays a new standard 5G is developed. The main developer is the company Huawei. "The main task for the fifth-generation networks will expand the range of consumed frequencies and the increase in network capacity. It is expected that the new technology will solve the problem, studied by all the operators in the world, increase the efficiency of the network infrastructure", – it was said in Huawei. The basis of the architecture of the next generation network technology will be SDN (software-defined network). There will be created the access to the broadband connection. Implementation of this technology is planned for commercial use in 2020. In testing this standard data rate of 4.94 gigabits per second was achieved.

Information technologies make our life more interesting and simple in getting the information and communication every day.

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MODERN ONLINE EDUCATION

Yevhenii Herasymchuk

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Adaptive content, which you can set as you want, education, which gives immediate financial effect, a possibility of continuous training throughout all life. All these facts create online educational one of the most progressive direction. Around the world, the market of online education develops with incredible speed.

The revolutionary idea of online educational consists that higher education becomes free, and therefore – public. You visit the website, you choose the course interesting you, you are registered and you follow instructions. It is usually offered not only look video or to listen to audio lessons, but also to make it in concrete terms, with the performance of tasks, total certification and obtaining the electronic certificate.To register for an online course the listener needs only suitable equipment and Internet access. Thanks to it a lot of people can complete courses they want.

The course "You learn to study: Powerful cogitative technicians who will help you to master difficult material", the Californian university created by experts in San Diego, is considered the most popular online course in the world. It was started in the summer of the 2014th on Coursera (the world's largest educational Internet platform) and since then managed to attract nearly 1, 2 million listeners. "Machine training" of Stanford University also overcame an amount of listeners in 1 million students.

Details of research

In September 2015, there was an issue of the International Review of Research in Open and Distance Learning magazine, the work of a group of scientists under the leadership of professor of physics of Massachusetts Institute of Technology David Pritchard. The work was for detail research of an introduction course of mechanics on the site EdX and its comparison with usual university courses of the similar contents.

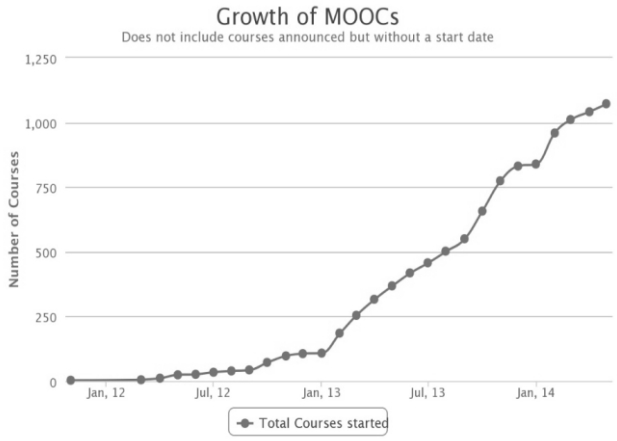

Figure 1 Growth of MOOCs

Scientists investigated results of tests which students handed over before the passing of the course EdX, with similar data on the efficiency of usual university programs. Thus the methodology which and is successfully applied for a long time at an assessment of the efficiency of traditional education was used. Besides, the additional statistical analysis of homework and intermediate examinations during the study was carried out.

On average students showed improvement of level of knowledge of a subject after passing the course on 0,31 points on the normalized scale (about one and a half points on five-point system). It's better than at the traditional education based on lectures.

Thus, interactive practical training is the main advantage of internal education whereas visit of the university itself and personal contact with teachers and classmates plays a supporting role. Work of professor Pritchard with colleagues covers only one of about one thousand courses EdX. Online courses can give to scientists a lot of data about process of training: it's not only demographic data of students and results of examinations, but also all intermediate tasks, and statistics of use of additional materials, communication in groups, viewings of lectures, etc.

Anant Agarval heads the platform of online formation of edX started by joint efforts of Harvard and Massachusetts Institute of Technology. According to him, long supervision only over one course brought so many data that "it would be possible to fill with them 110000 books".

"We fixed each click, – Agarval said. – All 230 million clicks".

Professional growth and improvement of the quality of the training materials, certainly, are important for the teacher. As well as the opportunity to share knowledge with a large number of students.

In conclusion, having estimated all pluses and minuses training online, it is necessary to draw a conclusion that such education is very convenient for us and is more modern presently.

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WHAT I LEARNED FROM REACT.JS

Vitaly Homonov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Modern web development becomes more and more complex because of complexity of users requirements. Accordingly, developers try to build more advantage tools to solve the problem of complexity. A wide class of such tools is frameworks and libraries. But one of the main problems of JavaScript ecosystem is dozens of libraries and frameworks that doesn't bring any new things, just repeat existing one in a little bit different manner.

But React does not. It brings a new era of front-end development via such new concepts, like Virtual DOM, component-based architecture, unidirectional data flow and immutable data structures. Let's describe them detailed.

Real DOM (Domain Object Model) operations are expensive. So guys from Facebook created an in-memory representation of DOM tree (Virtual DOM). And when one of in-memory nodes changes, special mechanism determines the difference between two tree states and finds the shortest sequence of operations to transform first state into second. Then this operations applies to the real DOM. And we see updated view. And we can reuse this idea. For example, one guy used it to show movie in simple console window.

What is "Virtual DOM tree node" itself? From the programmers side, it's the definition of view part, that has some layout, some styles, behavior, could receive data from parent node and pass it to the child nodes. From the framework side, it's the object, that represents knowledge about mentioned things. And such components could be combined and reused in any manner. Together they form application with tree-like structure. So a developer always has clear mental model of this structure, he has code base of reusable components, and this provides the ability to build complex application, regardless of use cases hardness.

But the basis of application is the data. Mental model simplicity depends on the data flow purity. In React data could be passed from the parent component to children. No more ways. If we want to change the data, we should provide an action for this in the component that owns the data, and pass it down like data itself. So child component has the ability to use this action. The sense here is that mutation is obvious, because we always know that mutation could be performed only by the data owner.

When we talked about Virtual DOM, we mentioned it's state. It closely depends on application state (a set of data in application at particular moment), because Virtual DOM state contains information about data, passed via its components hierarchy. And when data changes, view also should change as soon as in-memory DOM representation. But how it can recognize that data has been changed? In JavaScript world all objects passed by reference.

So there are two possible ways: reference (shallow) comparison and deep comparison. Of course, deep comparison is much more expensive. So we should perform shallow equality. And immutable data structures (immutable.js) give us this

ability. Immutability means that mutation returns new object with performed changes, instead of changing the existing one. This mechanism is internally optimized to reuse old parts of data, so there are no additional memory consumption. And it works very well with component-based architecture and unidirectional data flow.

So the combination of these ideas (which is kind of new in the front-end world) allows to developers to build complex web applications easy. And the main thing here is the soul of innovations: to take old ideas and to use them in new way to make life easier. All of us can do that. This is what I learned from React.js.

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WIRELESS SENSOR NETWORK OPTIMIZATION

Oleksii Horbatenkov
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In the last few years the demand and the application usage of wireless sensor networks in a variety of industries have increased significantly. Some features and limitations of these systems have caused the necessity to slove problems such as minimization of the network energy consumption, optimization of the network reliability and equal distributed load in the network.

In the network applications of sensors of data acquisition, motes are normally randomly scattered and densely deployed over a sensing field and are left unattended after being organized, that makes it difficult to replace or recharge their batteries. After those motes are formed into autonomous groups; those motes, which are placed near the data receiver, typically exhaust their batteries faster than others because of biggertraffic flow. When the motes that are around the data receiver deplete their energy, coverage and network connectivity cannot be guaranteed.

During the self-organization, every mote is supposed to communicate only with its neighbor, with mote within its transmission range. Motes are self-organized into clusters during initialization. Each mote chooses to be a cluster head or a member of the cluster in the distributed method. But self-organization – an advantage in a chaotic, random network deployment. Competent network topology and clusterization provide not only scalability, but also make the traffic route mostly avoid congestions during information transmission. Usage of protocols such as LEACH (Low Energy Adaptive Clustering Hierarchy) or PEGASIS (Power Efficient Gathering in Sensor Information Systems) makes it possible to minimize energy consumption.

To sum the above mentioned, we can say that the usage of competent topology and clusterization will help us not only to minimize the energy consumption but also

to make delays in the transmission of information as minimum, as possible, that will positively affect the speed and vitality of the network in total.

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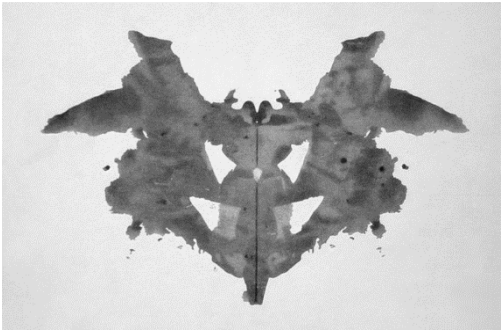
PSYCHOLOGICAL PORTRAIT DEFINITION IN SOCIAL NETWORKS

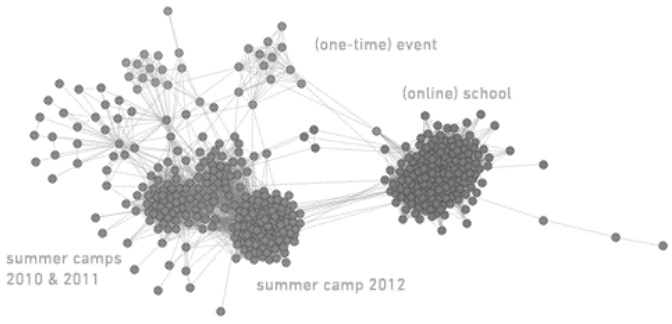
Viktor Hozhyi

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"



How we can define psychological portrait of some person? One of the first method was the Rorschach test, based on question "What you see here?" while showing special pictures [1]. This method was invented in 1921, almost hundred years ago and almost everything is changed, the Internet was invented and big part of human life was transported to it. So how we can define psychological portrait today?

If don't talk about general tests, one interesting method – is defining based on photos. Deeply exploring some key photos, we can understand how person spent his childhood, what happened before picture was token, and with this information it is possible to define some personal characteristics. Professor Joel Morgovsky has found whole new science area, called "photo psychology" [2]. He spent a lot of time to find all relationships between photo and psychology.



But much more interesting when we can use information from user profile of this person in some social network (e.g. Facebook), where we can see what he likes to listen, what posts, how many friends he has, how often he updates his status and so on! Even more – we can also see what friends he has, in what communities he is, and explore his social graph! It's began possible a very few time ago, when Facebook Graph was developed

(in 2013) [3]. Could you just imagine how much this information is big and important? You can even see a whole person's life in his social graph! So now sociologists and psychologists can deeply explore this new very useful feature. And I expect a lot of new in science, based on this Facebook feature, and new methods of defining person's psychology portrait.

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IMAGE RECOGNITION. ALGORITHM EIGENFACE

Olesia Ilchuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Identification system for voice and visual data is designed for the individual recognition in the field of mass congregate in the areas of control, at strategic sites.

The functionality of the system will improve the reliability of identification due to its multi-layered structure, based on the use of various biometric characteristics.

The differences in the characteristics of the algorithms allow to estimate the target conformity of application of a particular situation, while simultaneous use will increase the reliability of the identification. Next, consider the algorithms, some aspects of their impletion and the integration into the system. Fragments software are written in C#.

Algorithms for image analysis. The basic idea of the algorithm EigenFace is to find the "average person", ie. E. generalized and average options for all users in photos database. Using the resulting "average face" for each user photos is "the difference face", i.e. different between it and the "average person". The resulting "difference face" represents those features that are least likely to occur on the other images in the database. When a reflection on the input subsystem is calculated "differential line for him" and compared with each" difference face "in the database using the Euclidean distance:

The sequence of image processing using EigenFace.

Step 1: Preparation of an array of photos, which happens to using Haar features and OpenCV libraries. Image storage fragmented in a database in a matrix I [m, n] color values of its crest mudflows.

Step 2: Preparation of the matrix of images. Each photo distribution is converted into a vector line by line, where Incoming – the original image in a matrix form, and ImageVector – vector. Then, the resulting image vectors written in Common total matrix by columns.

Step 3: calculation of the average person to the image database:

The vector w weights eigenvectors each image storage fragmented in the database. Next on their basis the recognition. Each input image is converted to a similar algorithm. Recognition is to calculate the Euclidean distance of each pair (wBase, wInc) and choosing among them minimally. Here wBasei – weight vector eigenvectors i-th images from the database, and wInc – input image.

Gabor filter is an effective means of formation local characteristics of the digital image. Thus, pro-leading the two-dimensional convolution of the image with the Gabor kernel in reconciliation point x, y, we obtain local characteristic of this point. As Gabor filter is resistant to scaling and rotation operations, it can be used to identify the user needs. The input image is calculated as a feature vector, for which in turn is the Euclidean distance of each of the vector in a database. A suitable image is which has the feature vector with the smallest distance to the input.

Comparison of the characteristics of algorithms. Applicability of the algorithm Face Detection rhythms in different situations can be estimated.

It is important to note that because of the more calculations for each comparison algorithm is very sensitive to EigenFace database volume cannot be said about the algorithm to use of Gabor filters.

Conclusion. system was used for the experiment, in which swarm regarded as appropriate all the results do not exceed some threshold. Bork results instead of one, which increases the probability coincidence. The possibility of tightening or loosening the criteria pattern recognition of. Consequently, the performance of the algorithm using Gabor filters can be recommended for recognition people in large streams for primary screening. However, insufficient requires precision secondary processing of selected images more accurate algorithm, e.g. EigenFace. In turn, algorithm EigenFace can operate successfully in particular systems.

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INTERNET OF THINGS

Alina Ivanenko
Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In today's world exist a concept called the Internet of Things, in which the World Wide Web will be connected ordinary physical objects that surround each of us.Internet of Things concept appeared long ago, but its practical implementation is

not as fast as it looked 10 years ago. First of all, this is due to the fact that the number of devices on the network will be very large. Modern cellular networks are notadapted to work with the intermachine traffic in such quantity.

Multi-agent technology used in many developments, and the Internet of things is impossible without them. Each participant in the real world, each person and each device is assigned to software agent – an object with a certain degree of intelligence, which represents its interests in the virtual world. The relationship of the real and virtual worlds is bidirectional: solutions from the virtual world into reality are given for execution, and all the events of the real world (often unintended) impact on the virtual world. The life cycle of agents is quite simple. First they perceive information from the outside world. Then it should be processed, i.e. to plan some of action. Well, necessary to perform actions, giving the appropriate commands into the real world. The most common method of application development – it's only a way of storing knowledge, which is rigidly structured. At the same time this knowledge means only a certain essence of the physical world. Currently, we are witnessing the decline of sales in the previous sensational Internet of Things devices for consumers, such as fitness trackers, while the commercial products on the market of this segment of the situation – exactly the opposite. Then in 2016 the Internet of Things will win the corporate segment, because companies begin to understand the value of Internet of Things (*return on investment*, efficiency, productivity, etc.)

Analysts predicted that by 2016 there will be about 6.4 billion Internet-connected devices of things. This explosive growth in the number of connected devices in the IoT-means a growth of more data that must be collected, analyzed and stored. In the near future we will see a new stage of analysis of the data stream in real time and new market entrants, who will try to manage the rapidly growing volume of data. Since more devices connected to the IoT, this will increase the amount of potential threats and possible violations.

Therefore, there will be new security model based on the experience of implementing new technologies and to meet new challenges. In contrast to the trends characteristic of IoT consumer market, where the priority is the quick release of the product on the market is higher than the security measures in the corporate segment, IoT producers will have to find a balance of speed and security solutions.

The concept of "Internet of Things" will be developed not only in the "smart house", but in "intelligent enterprise", "smart city", and it is in these areas, it will be increasingly likely to develop. Trying to profit from information, which can be available from these sensors, will be the basis for further development of this concept. To influence at the situation can the companies, involved in the development of software for the Internet of things. The main problem today is the lack of standards in this area, which makes it difficult to integrate.

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"SMART" CLOTHES

Alexandr Ivanov

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In the past century, technology has evolved quite slowly, and every innovation has produced a great impression. Now, new technologies do not produce big furore. All people are used to that new inventions create every year and influence our life. No one was surprised by the word "smart". It refers not only to the clever man, but also to anything that has a memory, or the ability to connect to the Internet. Smartphones, smart watches, smart home appliances and even a smart home came to our life. But what do we know about smart clothes?

Smart clothes – is one of the developing directions of which only few people know. But companies such as Samsung and Google already thinking about ways of creating clothes such as smart as our phones.

It is not necessarily be the owner of Samsung company, to try those clothes on themselves, because there is already a set of electronic components intended for making tissue products clever interactive and functional. Brain of system is a microcontroller and the tissue is used instead of the PCB.

In addition, this microcontroller has a lot of additional functions. For example, the speaker module with a piezoelectric buzzer that can be used to play different sounds. When clothes have made with speaker module, it is able not only wink, but and transfer signal which people can hear. Such alarm can remind the patient to drink the pills, and to remind the athlete to make another exercise, or if the owner of the smart clothes need not sound signal, but need secret tips that will be vibration motor.

In addition, smart clothes can be not just a new toy – it's really a powerful tool which may be used in all spheres of our life. "Smart" clothes increase our chances of survival. It's really actual for people who have diseases or physiological abnormalities. "Smart" clothes allow you to check basic life indicators. It helps to track the condition of the people, who work with hazardous substances.

Thanks to smart clothes we can carry out analyze remotely or carry our distance medical consultation. It also helps the athletes, because "smart" clothes can be used to collect and analyze data of different physical activities that help monitor health. And even in the security sphere, military and survival. "Smart" clothes can help us to survive in extreme conditions.

Thanks to it, you can check the location. You can monitor status of soldiers when they fulfill a combat missions. Also you are able to control the level of fatigue of the driver or pilot. It exoskeletons and suits, which help us to feel better in difficult situations.

Although it isn't very extensive sphere, but thanks to its versatility, it's able to become one of the leading areas of new technologies.

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INFORMATION MEASURING SYSTEM

Oleh Ivanov

Faculty of Electric Power Engineering and Automatics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The article concerns information measuring system for detection of heat leaks in the underground heat networks during energy audit. To optimize the consumption of fuel and energy resources used in obtaining thermal energy for domestic and industrial needs, energy audits of heating are conducted.

Heating networks' condition plays an important role in reducing the unproductive heat losses during transportation from the source to the consumer place. The reason for it is the fact that total run-out of heating systems is over 50 %, and the actual heat loss is 60 % [1] while the standard is 13 %. The results of energy audits repeatedly confirmed the fact that the weakest link is not a district heat-generating capacity, which turned out to be often exposed to relatively inexpensive upgrade, but its transport component, the minimum cross-cutting fault of which is able to nullify all increasing efficiency. Therefore, professional energy audit is an important step to ensure the most effective operation of the heating system.

At present a significant problem in identifying thermal loss places in pipeline networks is the use of polyurethane (hereinafter – PUF) insulation. These pipelines are a strong and sound proof with their service life of over 30 years, but studies have shown [2] that due to violation of their laying, usage of poor quality substandard materials for pipeline construction and aggressive action of coolant, a great number of pipelineswill have become dangerous in 3-5 years of operation.

The present article describes the functional structure developed by information measuring system during which energy enables a high degree of probability to find defects in heat underground networks of channel-free laying of pipelines in polyurethane insulation, resulting in significant heat loss during the transportation of heat carrier.

Contact thermal, contactless acoustic and inductive non-destructive methods of control are the basis of information measuring system work. These informative parameters for identifying thermal losses placed in heat underground networks are the temperature of the surface layer of soil, acoustic pressure and current in the walls of the pipe measured on the ground surface above the investigational pipeline [3].

Application of the complex and informative parameters to information measuring system developed by the method of identifying the type of defect [3] made it possible to significantly improve the accuracy of heat loss detection and evaluate the technical condition of the pipeline. So, the following classification of major defects that occur in pipelines with PPU insulation was proposed: "rupture of the pipeline", "destruction of heat and hydro insulations", "waterproofing destruction, "migrating water".

Determining the current in the walls of the pipe allows you to find the route of the pipeline and to determine the depth of its occurrence. In addition, the abrupt change of the current values can indicate a significant depressurization and pipeline ruptures. Since foam pipe insulation has significant absorbing properties, the location of the defect, particularly of a small size is difficult to identify using acoustic method. Therefore, forcing acoustic excitation of pipeline body with the help of magnetostrictors is used by information measuring system, allowing to use it as long non-directional sound conductor. The acoustic pressure on the soil surface is measured by a narrow microphone. All of the above types of defects are found by acoustic methods.

Thus, described information measuring system allows to find defects in heat underground pipeline networks and in foam insulation that causes heat losses with a high degree of probability. This enables utilities to respond quickly to the situation and to save money on repairs and reduce time of consumers being disconnected from the heat.

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DETERMINING LOAD OF GRID-SYSTEM NODES

Oleksandr Ivantsov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today distributed computing based on GRID technology is being actively developed. Global GRID systems also get progress. Up-to-date data about the parameters of GRID-system selection and appointment of the most suitable components for computing tasks are involved, which decision will increase the efficiency of the entire computing system and increase the capacity of the system. If computing system is heterogeneous, it's extremely important [1].

GRID-system planner solves managing and distribution problems. Most GRID-system planners make decisions about binding task to the calculation node and evaluate workload of its node with the help of external features. Productivity of scheduler can be improved by providing it with more information about the node for comparing two separate subsystems and selecting the best of them.

We should provide information about GRID node to Grid planner for estimating this workload. This information also will be used for assigning tasks to GRID-system computers. Obviously, GRID planner must have up-to-date information about each GRID-node, for an optimal estimation of this workload.

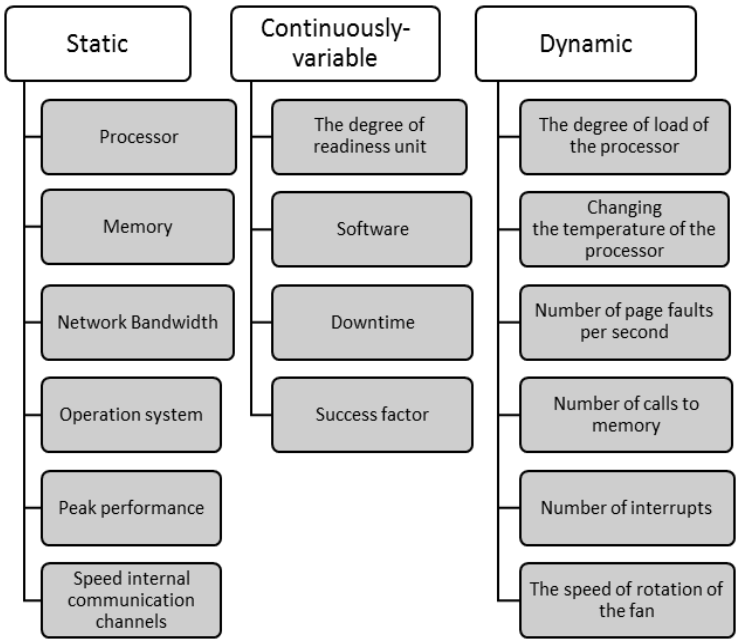

Fig 1. GRID-node

Moreover, information about configuration of node and its processing power is not enough for optimal planning, because the GRID-system works in real time and its condition changes every second. That is why, computing GRID-node characteristics may be divided into three main types, and as it is shown in Fig 1.

This division gives a good performance of which characteristics should be stored on the server, and which of them should be updated for the latest information in each moment of a time. Moreover, we can get current schedule of updates of each item, based on this classification.

Based on constant parameters, we can talk about accordance of the customer for compute nodes, (if the customer put forward specific requirements for virtual computing environment), it makes possible to immediately weed out the variants, that insufficient to put forward by configuration or processing power.

Based on changeable parameters, a planner receives information about workload of the unit at a particular time, which makes it possible to choose the less loaded node and avoid stoppages of tasks in the queue to the processor.

Continuously-variable characteristics serve as an auxiliary. If the analysis of variable and constant parameters is not given, the best node for a specific task can be chosen, it is possible to conduct additional analysis units, taking into account the continuously-variable parameters. Using the above characteristics there is ability to optimally allocate tasks between nodes of GRID-system. Planners will have more information for the analysis and selection of optimal resource because it might consider not just power of node, but also its current state. So tasks will come on GRID-nodes uniformly, but not always the most powerful node is loaded.

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IPTV – THE FUTURE OF TELEVISION

Mikhailo Kagarlikskiy
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays WEB-technologies are developing rapidly. Today we can communicate, draw, sell and even watch television on the Internet. Internet protocol television first appeared in 1995 and it was a simple Windows/Linux desktop program created by Bill Carico. When you watch TV, you receive TV show as broadcast signals through cable or a satellite. But how does IPTV work? You can watch it on a computer or a TV screen simply through your web connection.

There are different kinds of internet protocol TV. The most popular one is called VOD. Video on demand is very simple in use, you just select a TV program you want to watch using a special service and watch it on a website. Some airlines provide VOD to passengers through controlled screens. VOD systems allow to watch TV programs in real time or download it to a device such as a smart phone or a computer for viewing at any time.

The second kind is time shifted IPTV – a system that allows pre-ordered TV viewing. Today a digital video recorder has made time shifting easier, by recording TV programs onto a flash drive. The third kind of internet protocol television is real time streaming video that involves broadcasting live TV shows via the World Wide Web. All of these kinds can work in your web browser. Some reasons why will IPTV become the future of television:

- The Internet becomes cheaper. Today about 4 billion people have access to high-speed Internet and number of web users increases every day so IPTV will continue to gain in popularity. Most IPTV providers offer cheap services, for example Amazon or Sky+ cost only 7 dollars per month.
- IPTV can be used for communication between communities. Companies are beginning to use internet protocol television to broadcast company conferences or other corporate events.
- Today more and more people access the Internet from their smartphones than from their PC. With IPTV customers are able to watch TV wherever they have an Internet connection.

In conclusion, cable TV or satellite technologies will not disappear but broadcast TV signals must be converted to IP television. IPTV is definitely a future of modern television that will make our life easier.

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PROJECT AIRGIG: BROADBAND ACCESS TO THE NETWORK FOR POWER LINES

Inna Kalinina

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today, engineers are constantly conducting research, trying to improve the performance and efficiency of networks. IEEE 802.1Q development group improved management practices that will eliminate the packet loss in case of usage of overloaded ports, Internet Engineering Task Force command creates a protocol for link layer connection, capable of providing the shortest connection via Ethernet and so on.

Also, work is underway to improve the sampling data for transmission to distribute the unused part of the connection for different traffic classes.

Maintaining the high quality of the connection in the networks is an important task for modern organizations. This enables them to provide customers with the best services and the increase usage of network resources to the maximum.

However, connecting to the Internet in some cases is impossible for the residents of some regions. For example, for settlements located far from the major infrastructure projects. In some places Internet is either expensive or slow, or both. Currently, several large technology companies engaged in projects to connect remote and inaccessible areas of the global network. Google launches balloons with access points, Facebook does the same thing with the drones. Some companies offer to launch into orbit a lot of small and relatively inexpensive communication satellites, which would provide residents of the entire world with Internet.

AT&T Labs company offers several interesting solution to this problem. A lot of the company's experts are now engaged a project that will transform the power lines in the wide data exchange channels. And because the power lines are present practically everywhere, the global network will be more accessible to millions of people around the world.

The developers claim that their technology can work anywhere in the world where there is a power line. The AT&T say they do not need to license frequencies for this technology. Its advantage is the fact that it opens the possibility of superfast link to any connected user. And since it uses already ready infrastructure, the deployment of such a network is much easier than, for example, an optical fiber.

The technology allows you to quickly provide a network connection for remote regions where previously it was not possible to use a fast Internet connection. The first network of this type, according to AT&T representative, will begin work in 2020. For such a network, additional hardware is needed, so Internet providers and operators will bear the costs. But these costs are significantly less than what companies normally spend in the deployment of a new network infrastructure.

This project was named Project AirGig. For its realization, the company had to develop a number of new methods and technologies, which are now patented. Among other developments of this initiative are cheap plastic antennas and repeaters, devices

that transmit a signal along the entire grid. The performance of these networks is similar to networks of 4G LTE standard.

The technology is quite flexible, allowing you to use distributed antenna systems, or small cells. You don't need to dig or build cell towers for the laying of new channels of communication. Special miniature stations that transmit signals in the millimeter range from station to station should be installed on the power lines (or telephone poles). The range of such a station is only a few meters.

So far, the project is in the testing phase, the company is trying to understand how attractive a new type of communication will be for users and businesses.

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GENETIC ALGORITHM FOR SOLVING THE PROBLEM OF SPLITTING THE SET INTO SEVERAL SUBSETS

Roman Kalnytskyi
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Often problems of making optimal decision can be formulated as a discrete optimization problem. NP-problems occupy a special place among them – problems which have no known polynomial algorithm to solve. In these cases, pretty good results are obtained using metaheuristic algorithms, including a genetic one [1]. Although the genetic algorithms due to their stochasticity do not guarantee the optimum solution for a finite time [2], but they require less memory and time to process large amounts of information unlike search algorithms with ordered search space (dynamic programming, branch and bound, etc).

The idea of the algorithm presented in this paper, appeared during the development of genetic algorithm to solve the problem of splitting the set into several subsets ("The stones problem"). At the very beginning standard genetic algorithm (SGA) was used but neither it nor one with local search gave the desired results.

SGA application just caused filling population by solutions with local optima. Taking into account step sequence characteristic of the algorithm, the probability of "getting stuck" in a local optimum because of filling up the population with large amount of very similar individuals is quite high. This is caused by absence of any way to get radically new solution with new features except standard mutation mechanism.

During solving described problem, a modified mutation mechanism was designed: one mutation (for entire chromosomes) is necessary, but there may be the appearance of others. Herewith, the probability of extra mutation needs to be based on likelihood of parent chromosomes.

Thus, an offspring of identical parent with probability 0.5 will get more than one mutation. But the designed method was not effective enough. Another problem has occurred – firstly, population was filled with analogous entities and after this, using described method, a slightly worse offspring was generated, that is why they could not go through natural selection.

Solving this problem (making space for new alternative solutions in situation when population is filled up with homogeneous chromosomes) became the main reason for designing of new genetic algorithm – genetic algorithm with blood cleansing (GABC).

The classic algorithm gets an extra step before natural selection – *blood cleansing*. Using formula (1) amount of chromosomes to be removed from population is calculated:

$$D_q = \left\| \left[\frac{erf((S_T - 0.75) * 15) + 1)}{4} * n \right] \right\|, \quad (1)$$

where S_T – likelihood level of all chromosomes in population ($S_T \in [0;1]$); n – population size.

The index of chromosome to be removed from the population is calculated using the ratio:

$$I_{bc} = \left[n - 0.1 \cdot e^{\ln 1 \downarrow p_1 - 1} \cdot n + p_2 - 0.5 \right], \quad (2)$$

where p_i – random numbers with normal distribution from 0 to 1.

It is assumed that the less adapted individuals have a higher index in the population. Simultaneous use of all of the above modifications forms the new algorithm.

To test the effectiveness of the algorithm a series of problems with all possible combinations of optimum size (11, 101, 1001, 10001) and the number of sets (10, 100, 1000) were generated. For comparison standard genetic algorithm with local search was taken. The result was that the designed algorithm is much more accurate for large scale problems. At any other combination it acts just better.

So GABC gives better results with any problem parameters combination. With the increasing of allele variability accuracy of the algorithm becomes several times higher than the standard one.

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PROJECT NATICK. LOCATING UNDER WATER

Dmitriy Kaluzhniy
Faculty of Chemical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Since 2004 the amount of electricity spent on climate control in DPCs, DCs and server rooms became equal to the quantity of electricity they spent. With time the situation is only getting worse. Firstly – more compact systems are used – form factor 1U and Blade servers, and therefore the heat dissipation become more complex. Secondly – the technology of virtualization and cloud computing have increased the load on the equipment. Therefore, many companies choose colder countries for their data centers. Microsoft Research has decided to place theequipment under water relating to the project "Natick".

In 2014, during the experiments, the Microsoft Corporation had an idea – the DPC under the water. Underwater streams can be used as an energy source and water will cool the equipment (it is placed in a sealed steel container to prevent the damage). The dimensions of the capsule are 9 meters in the length and 2.4 meters in the diameter. The first test was conducted close to the California's coast. The staff equipped with hundreds of different sensors to measure the pressure, temperature, humidity, etc., controlled the container remotely. One of the main hazards of this experiment could be an unexpected hardware bugs. Thereby, the duration of experiment was set for 105 days and eventually the server has even been working with the commercial data (Microsoft Azure).

Speaking about the harm to the environment. The capsule's temperature under load was so small that at a distance of 10 centimeters water temperature was normal for it. After prototype's return to the company it was slightly overgrown with small shells.

The success of the first stage testing allows the research team to plan the development of the next version of the capsule, which is going to be three times larger. In consideration of possible power supply problems, the group of experts of an alternative energy will be involved next time.

But there was only the first test. No one can be sure in global success of this project. Thus, we get a lot of advantages – no need to rent a server room, no cooling costs and data center power and setting closer to the user. About half of the earth's population is currently living in the allowable range for a given project. Thus the quality of the signal will be improved and the delay will be decreased.

Two years needed to deploy such kind of complex on the earth. While it only takes 90 days in the water that allows using it in emergency situations.

Experts expect that the data center will be developed in 5 years, after it will be updated to the latest trends. In general, the data center will be used 20 years, and then be processed.

Despite the success of the project, the team will have to overcome such a problem, as the capsule underwater fouling organisms, since a few years it may cause damage to the system of alternative power and temperature balance.

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SAAS

Artem Kaplunov

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

SaaS (Software as a Service) is a model of business applications in Internet services format. SaaS applications are running on the SaaS-provider's server, and users can access them through a web browser. The user don't need to buy a SaaS-application, he / she pays his rent every month.

Thus, the economic effect is achieved, which is considered one of the main advantages of SaaS. SaaS provider takes care of the application functionality, provides technical support for users who own the update. Thus, the user is thinking less about the technical side of the issue, and focus on their business goals.

The main advantages of SaaS over traditional software:

- lower cost of ownership;
- shorter implementation time;
- low entry threshold (can be tested quickly and free of charge);
- the task of supporting and updating the system is fully borne by the saas-provider shoulders;
- full user mobility, limited only to "internet-coated";
- support for geographically distributed companies and remote employees;
- low power requirements the user's computer;
- cross-platform.

The disadvantages of SaaS are considered as unsafe transmission of commercial data to an outside provider, low speed and unreliability of access due to disruptions to the Internet. However, strengthens the image of SaaS-providers, the development of encryption technology and broadband Internet access gradually dissipate these fears.

Alternatives to SaaS. There are alternative technologies in relation to SaaS. They are intermediate variants of the transition from traditional software to SaaS, and is likely to soon disappear.

S + S. This is an alternative brand, promoted by the Microsoft, which is different from SaaS that is not a browser and client software used on your computer.

Rent (hosting) applications. This option only differs from the SaaS architecture server side and is not visible to the user. So it is often referred to as application hosters of SaaS-service services. The difference is that classic SaaS services are multitenant-architecture, one application serves many clients, and application hosting involves the installation of a separate copy for each client. The second option offers more customization options, but at the same time, it is more complex to administer and update, and therefore is more expensive.

The use of cloud platforms. Companies are afraid to give your data to an outside provider that is sometimes limited by the fact that the lease on the internet is not an application, but only the computer power and set them on their own (bought) the system. There is cloud platform for such an option.

Although many leaders of technology SaaS (software as a service) still seems to matter for the future, it is already possible to say exactly what will happen after it. The idea is that the real business does not need software (or on your own server, or on a third-party provider's server). They need solutions to specific problems. They need services, they can be ordered over the Internet, and get ready to monitor the results through the Internet. Of course, this is not some kind of super-new idea. SaaS-providers communicating with the clients themselves have come to understand this, and added to its non-program application value.

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SECURE SHELL

Dmytro Kasyanchyk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, it is hard to find developer, which did not use version control system. And all of those people know about SSH. Secure Shell is a important part of all version control system, because it use to transfer files.

What Secure Shell really are?

SSH is a special network protocol which use to securely communication between two difference computer. SSH enables to run terminal and programs with user interface, transfer files, and make your own networks over the Internet which is secure.

The first version of the SSH, was created in 1995 by Tatu Ulenen who was researcher from the Helsinki University of Technology (Finland). This technology has been written to provide greater privacy than other popular protocols. SSH was designed after password attack at network of his university.

In 2006, the protocol was approved as an Internet standard by the IETF.

Support SSH is present in all UNIX systems, almost all of them include client and the SSH server. There are many implementations of SSH-client for non-UNIX operating systems.

For work with Secure Shell user need SHH-server and SHH-client. The server listens connection from client computers, and where occur connection server performs authenticate and then starts the client services.

Authentication protocol in SSH server uses algorithms based on digital signatures RSA or DSA, but also can be authenticated with a password, and

sometimes the ip-address of the host. Password authentication is the most common. Each connection is produced the shared secret key to encrypt traffic. When user use authenticate over keys pair was generated public and private keys for the specific user. Both files are stored on the remote machine and the user's machine.

These files are not transferred during the authentication, the system only checks that the owner of public key also owns of private key.

Authentication over ip-address is not safe, therefore this feature often disable.

To secure data on the Internet used SSH-tunnel. This tunnel created by the SSH-connection and used for encrypting tunneled data. When transferring unencrypted traffic of any protocol through SSH-tunnel traffic is encrypted at one end of the SSH-connection and decrypted on the other.

So, in conclusion, SSH – a special network protocol that allows remote access to a computer with a high degree of connection security. However, current version of SHH is not ideal, and it will be major update. In the third version, according to developers, the emphasis is on key management processes. This update will make the work with SHH more safely.

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STORING AND PROCESSING LARGE AMOUNTS OF INFORMATION

Daria Katiushchenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Information technologies are constantly evolving and amount of information which must be stored and processed increases exponentially respectively. For example, Hubble archive has more than 20 TBytes of information. Of course, it's not possible to increase progress without saving previous experience, and traditional methods cannot always give result of treatment within a reasonable time. Therefore, in recent years "Big Data" has become a well-known term, which is meant a large volume data and treatment technology for them.

There are three components to characterize Big Data: volume (physical), velocity – the velocity of growth, treatment velocity and velocity of getting result, variety – possibility of simultaneous processing of structured and unstructured data.

The first mention of "Big Data" was in 2008, and since then a number of processing technologies of large amounts of information has been developed, such as NoSQL, MapReduse, R, Hadoop etc. Some of these technologies can even maintain relational database management systems and SQL language. But the most spread technology is Shared Nothing Architecture, providing massively parallel processing, which can be scaled to thousands of processing nodes without degradation [2].

Oracle, EMC, GreenPlum etc are working to provide hardware solutions for processing large amounts of information. Now you already can buy in these companies data processing centres – telecommunication cabinets, containing clusters of servers and control software for massively-parallel processing [1].

Scientists and IT-specialists around the world are working on the problem of storage and processing of information, which is growing in volume constantly. Over the past 8 years new processing technologies, hardware solutions and methods of analysis of information have been developed, but a number of unresolved issues still remain. And I think they will always appear because the amount of data from the science experiments to messages in social networks will increase every year exponentially.

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QR CODE RECOGNITION

Illia Kazmirchuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In the twenty-first century we are surrounded by devices and machines because we live in the time of technologies and inventions. We are so used to technology, that why we don't notice them.

Can you imagine your life without computer, smartphone, credit card or ATM? I think you can't. Innovation burst into our lives and changed us forever. But one modern invention can be called the most important in our century. You would never believe, but it is QR code. Just look around! QR codes are everywhere: on clothing, food, household appliances. This is pixelated picture, which originally used by the automotive industry. Nowadays you can find it everywhere. QR codes are a technology that deserves our attention.

History of QR Code

Quick Response (QR) – it's a two dimensional barcode system. It was invented by Denso Wave in 1994 to scan components at high speeds. He was an owner of a Toyota subsidiary and used QR code as a way to track vehicles as they were assembled. Unlike one dimensional barcodes, QR codes are more exact and protected.

Firstly, QR code consisted of 21 pixels, which includes 4 symbols. The latest version of this code includes more than 170 pixels and more than 3000 characters. It is enough for a few pages of

information. QR codes can hold 100 times more data than 1 dimentional barcodes. To cut a long story short, QR codes – it is a lot of information in a limited horizontal and vertical space.

How do you use QR Codes?

People use QR codes on different ways. For example: on business cards, on travel tickets, in healthcare facilities and even on gravestones to connect people to a website about the deceased. How we can read QR codes? First of all we can do it using special apps for Android or IOS devices. All you need is your smartphone. You have touse your phone's camera to scan the QR code, which will then automatically load the encoded data for you. There are also programs for Windows to scan QR codes with web camera. In factories people use a special QR code's scanner. You can also generate your own code. You have to enter the information, which you need to translate. Generator will produce the code, which can be display electronically or printed. You can put information about yourself into one small picture. It can help you to save your money on business cards.

QR code is the latest development. It improves our lives and makes it easier. It is a compact and convenient way of saving and transmission of information. That is why to my mind it is a very interesting and important innovation.

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QUANTUM RANDOM NUMBER GENERATOR CREATED USING A SMARTPHONE CAMERA

Andrii Khimich

Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

One of the most rapidly growing areas of mass technology is the mobile devices market. Their popularity is caused by their availability, simplicity and usefulness in everyday life. Mobile devices are becoming the data storage devices and transmitters of huge amount of personal information as well, and, as a result – targets for different types of cyberattacks. That is why protection of personal information has become a necessity, which cannot be ignored. Therefore, nowadays, in the information age, the need for reliable encryption algorithms is very high.

Thus, particular attention is paid to the encryption keys. Actually, the most vulnerable points are the generation of large prime and random numbers. However, if the generation of large prime numbers is a purely algorithmic task, the generation of truly random numbers using a deterministic algorithm is impossible, because the generated sequence will not be truly random, but only approximate some of its properties. Deterministic random number generation algorithms are called RNG (a random-number generator). Their main disadvantage is that they loop, starting to repeat the already known sequence, thus are unacceptable in cryptographic algorithms. Therefore, for a lot of tasks using RNG is not safe enough.

However, there are hardware random number generators, also called true random number generators (TRNG). They generate truly random numbers by using both mathematical and hardware methods. The work of detectors is based on so-called reliable sources of entropy – physical processes, predicting the behavior of which is theoretically impossible. These sources include various noises such as thermal, photovoltaic, radioactive and other processes that are influenced by the laws of quantum physics. However, these generators also have some drawbacks such as their relatively low speed comparing to the RNG due to the difficulty of obtaining informative entropy source. There is also a problem associated with the expectation displacement of the generated sequence of bits, which is caused by the peculiarities of physical processes.

The problem of developing effective hardware random number generators is an important problem for many scientists. Currently, most drawbacks of TRNGs have been sufficiently solved, e.g., equal probability of bits can be reached by using a hash function. However, search relevance of efficient, cheap and available sources of entropy and mechanisms of their reading is still large enough.

In 2014, physicists from the University of Geneva in Switzerland showed that the quantum random number generator might be used via an ordinary smartphone camera. The work was based on the theory that the number of photons emitted by most of light sources is a random value at any moment of time.

The experiment was conducted with Nokia N9 smartphone, which has 8MP camera. During the process it was found that its sensitivity was sufficient to accurately determine the number of photons falling on each pixel. The preparation process was to find the number of photons needed to saturate the pixel. This number sets the limit, which is unacceptable to be reached, because in this case the results are not random. The next step was to turn the charge on each pixel in a sequence of random numbers.

As a result, a generation speed of 1Mbit / s in a real smartphone was achieved, which is more than enough for most mobile applications. Moreover, under laboratory conditions it reached about 1.25 billion bits / s. All tests for randomness were passed and now the technology is waiting for companies to show their interest. But it is only a matter of time, as everyone wants to be sure about security of his personal data.

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BRAIN WAVES AS A WAY TO PROTECT PERSONAL INFORMATION

Yanina Khokhlova

Faculty of Heat and Power Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Cyber security is one of the most important parts in our world. Every day a big amount of nonpublic information ceases to be private. Everyone needs a special safety of information, stored in electronic format.

That's why it is so important to create protection system which will give people assurance that the information won't become public. One of such new technologies is the usage of brain waves to identify the user.

Fingerprint scans and iris identification are two widely spread methods of authentication of users. But they are not safe, because iris and finger prints can be replicated. Brain waves are unique and couldn't be replicated. An electroencephalogram (EEG) can be used to reveal and authenticate user. The main argument of using an EEG is that popular methods of protection, like simple password or fingerprint scans and iris identification, indicate you just once, when you enter the system. System doesn't track, who use it, while working. And if we talk about protection with using brain waves, monitoring changes in identification of user will be during the whole time of using the program.

Such model of authentication procedure can be realized using an electroencephalogram. This system can indicate different aspects of person's life: behavior, health and even emotional condition. Nowadays there are no methods that can provide patterns for behavior or emotion condition of the person. But there is some research in this area. "There are no installations yet, but a lot of research is going on to see if EEG patterns could be incorporated into standard behavioral authentication procedures" – Serwadda said.

Nowadays you can buy a little device, which should be fixed on the head, and use an application for connection this device and your computer or mobile phone, or any other gadget. And then your brain waves and signals will be used for accessing the information, which is stored in electronic format. What is more, using such system is absolutely safe for health. In conclusion, there is a big amount of different types to secure electronic information. But all of them use "one time access", besides the systems, which use brain wave to control the user authentication.

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MODERN SPA FRAMEWORKS

Vladyslav Khrapov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Every year we see an increasing trend in the development of Javascript language and powerful tools and frameworks for it. Recently, developers haven't heard anything about SPA and complex, rich UI, but nowadays nobody can imagine the development without modular and structured workflow.

SPA – Single Page Application is an approach for developing web application, where we need high performance and sophisticated business logic. Such kind of applications are usually created by a large team and it is a quite tricky task to sync and cooperate with all team members. So this is a place where frameworks come in.

These frameworks work well on devices, both desktop and mobile. "Big" computers, tablets, smartphones, and in the end – simple phones (some) are free to work with sites built on the principles of SPA.

There are huge variety of them today: Backbone, Ext, Angular, Angular 2, Ember, React, etc. From my point of view the most powerful of them are React and Angular 2.

React was developed by Facebook and gives you a template language and some callback-function for rendering HTML. All React work result – it is HTML. Your binds HTML/JavaScript, called components, are committed to keep its internal state memory (e.g.: which tab is selected), but in the end you just get pure HTML. To do this, it uses a powerful JavaScript syntax extension called JSX, that can be used for communication between your component and a markup.

Angular 2 is a framework that gives you opportunity to build any kind of client SPA application using Typescript out of the box or any other language like Dart, CoffeeScript or pure Javascript. Typescript is a superset of Javascript that brings language static typing and helps toreveal many errors during the development. Angular 2 consists of several libraries that can be downloaded separately.

Angular 2 style slightly differs from React. It connects component class to "angularized" markup for managing them and put additional application logic into places called services and for boxing that all in modules.

React and Angular 2 are great solutions for SPA development and are worth to be used on complex projects in 2016.

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ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

Victoria Khrystych
Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, advanced technologies, direct information, documents in paper form and storing them in archives and criticized, to replace this hierarchical

organization management system, comes a new electronic document management system. These systems are designed to automate the process of managing hierarchical organization management system and create fast and efficient, multiplayer system which embodies a single mechanism to work with electronic documents. The introduction of these new electronic documents is relevant and one of the key problems in Ukraine.

I want to talk in more detail about what the system is. The basis for understanding these systems are three concepts that I am going to cover.

The first concept – workflow is the movement of documents from their inception to the completion of complex work with them admission, registration, distribution, control of formation affairs, storage and re-use of documents, information work.

The second – an electronic document that is created by means of computer processing of information, which may be signed electronically signed and saved in electronic form as some file format.

The third key concept and an electronic signature – which is a guarantee of authenticity of electronic documents and handwritten signature analogue, it is a means of protecting the information that provides the ability to control integrity.

Based on the above we can conclude that the system is much simplify our lives. So why do we not rush to implement them? The fact that our computer systems are not stable in terms of security and stress, loss of user data – a big minus and omissions, but the loss of important government documents – a problem much larger scale than can be imagined. What will become of us if the fall this large base, especially if you cancel importance of paper and media? We will be very vulnerable if we can not come up with a way to protect their information electronically. That is the issue and involved many scientists that in the future we lived much easier without paperwork and endless queues.

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TELEPORTATION. MYTH OR REALITY?

Serhii Klymenko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Probably every one of us once in our life thought about teleportation, which described in many science fiction books and shown in many films. This is indeed a very useful thing that helps in hostilities, faster delivering of sick person to the hospital and quicker travel from one place to another. It also helps to move any things for hundreds and thousands of kilometers in a matter of a second – but it happens only in the imagination of people.

Nowadays mankind know nothing that would help to perform object teleportation exactly as described in the books and films. However, scientists introduced the concept of "quantum teleportation". "Quantum teleportation" is

a quantum state transfer over a distance with help of dispersed in space concatenated couple and classical communication channel which force to destroy the state at the point of departure during the measurement, then play at the point of reception.

This term was first announced in 1993 by Gilles Brassarom and Charles Bennett in the article "Teleporting an unknown quantum state via dual classical and Einstein-Podolsky-Rosen channels" in the magazine "Physical Review Letters", which describes what kind of quantum phenomena is proposed to call "teleportation "and how it differs from the popular science fiction" teleportation". First we need to understand that the quantum world lives by quite other laws than our "big" world.

The principles of common sense based on the "macroscopic" laws of nature do not work. In particular, there is a state of quantum "entanglement" of two particles. This means that if we are "confuse" two photons, one photon will "feel" that happens to another instantly, regardless of the distance at which they are located.

Also quantum teleportation does not transfer energy or matter at distance. Quantum teleportation is not used for "immediate" transfer of information, but for the most accurate and most secure. No one can intercept a quantum signal. You can also note that the greatest achievements in quantum teleportation took China. In the summer of 2016 it was able to teleport the quantum state of a particle at the 1200 kilometers between stations Delinhe and Lijiang via satellite.

Thus, we can firmly state that in the next few decades we will not be able to even think about teleporting objects at a distance. However, in anticipation of professionals by 2035 quantum teleportation will be implemented almost anywhere.

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RAID LINUX FILESYSTEM

Oleksandr Kogulko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

RAID – data virtualization technology, which combines multiple disks into a logical element for redundancy and improved performance.

Abbreviation "RAID" originally stands for "Redundant Array of Inexpensive Disks" ("Reserve Array of Inexpensive Disks", as they were much cheaper then SLED disk (Single Large Expensive Drive)). Over time, "RAID" steel deciphered as, because the arrays have to use expensive equipment (for inexpensive disk drives meant for the PC).

Some forms of RAID allow you to combine disks together to increase the apparent contiguous size. They do not protect your data – indeed, they increase the risk because failure of one drive will lose the data on all the drives.If you do not combine them with any other form of RAID, it is best to buy a drive with larger capacity.

Some forms of RAID store multiple copies of the data, so if you lose a disk, you have an identical copy elsewhere. This facility is sometimes used for backups – remove one of the disks from the array and store it safely, replacing it with another disk. Because storing multiple copies can be very wasteful of space, other forms of raid store parity along with the data, so that if a drive fails, the contents of that drive can be calculated from the other drives.

RAID combines several disks into one logical storage so as to use it as one disk with large capacity. RAID divides the requester I/Os into certain size called stripe unit or chunk and distributes them in multiple disks.

For most versions of RAID you will see a performance boost. Obviously this depends on a lot of things, but this is another reason for going down the RAID route. There are currently three dominant flash file systems for Linux: JFFS2, YAFFS2, and UBIFS. JFFS2 has issues scaling to large sizes and does not write the index data to flash as it goes, but instead reconstructs it every time the system mounts. This means mounting a large JFFS2 file system can take a long time, which would only be worsened in the context of RAID. YAFFS2 and UBIFS do write their indexes to flash as they go but have other issues. UBIFS is the most advanced of the three but is somewhat immature, very complex (three times the code size of JFFS2), and has high storage overhead for the index (over 10 %).

For error-free operation is necessary to make improvements JFFS2 which eliminate its main deficiencies and add RAID capability. The index is off-loaded to a more expensive non-volatile storage medium such as PRAM or battery-backed SRAM. The added cost of the index memory is offset by the reduced storage overhead, faster access times, and reduced complexity compared to UBIFS. The implemented RAID-based file system, JFFSR, is compared to JFFS2, YAFFS2, and UBIFS.

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FOG COMPUTING OUTLINES

Valerii Kolesnik
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The "pre-pay" or pay as you go (PAYG) approach for providing web services with cloud computing (CC) is faulty option for occupying and managing corporate data centers (DCs) for those who needs high performance calculations and web application on real time.

The advantages of using mega DCs are the following: identity of prediction processes of node aggregation, which provides higher usage of resources without decreasing performance; favorable position that is more preferable due to cheap power; distribution of homogeneous processing units, storage and networking units.

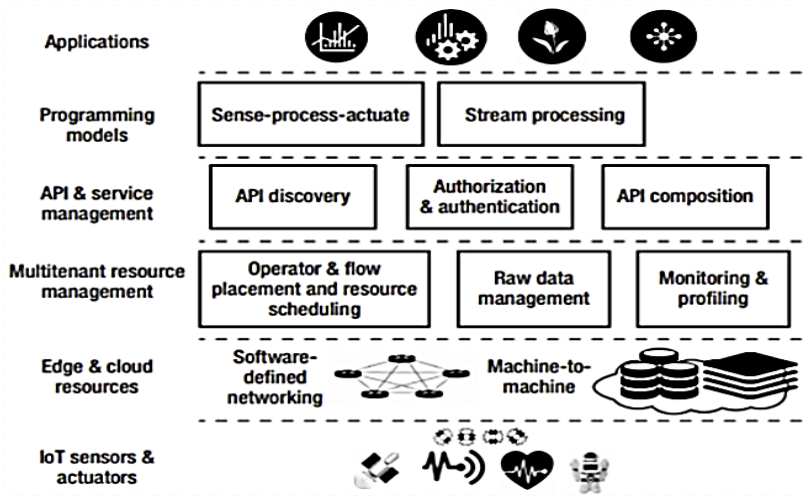
CC saves the business and the service user from consideration of many specific details. Such advantage becomes an issue for delay-sensitive services, which require more surrounding nodes to match their demands. An increasing amount of internet deployments, especially the internet of things (IoTs), demands a flexible support and geographical allocation as well as position awareness and low delaysin the system.

In order to satisfy the requirements a new platform named "Fog computing" or, simply, Fog, was invented. This name was chosen essentially because the fog represents a cloud near the ground.

Due to that rather than cannibalizing CC, Fog Computing enablesdevelopers to create a new breed of applications, which gives a fruitful interplay between the Cloud and the Fog, particularly when it comes to data management and analytics [1].

The Fog Computing model for storing and processing data implements CC based computing technology, but with one main difference: the core processing nodes are not cloud servers; "ground" devices such as personal computers (PCs, gadgets, household equipment, drones, camcorders, etc.) are used instead.

Fog is a networkof "drops" – microcontroller chips with memory and interface for data transferring on the board, and wireless mesh network chip. These "drops" receive power from small battery, which nevertheless is enough for few years of work with regular interruptions for sleep. The "drops" can have inputs for input devices (temperature and voltage sensors, tracker and ultraviolet emission sensor) and for output devices (light emitting diodes or LED, dry contacts, liquid crystals or LCs, etc.). These devices also called fog nodes and they can be distributed anywhere with a connection to the Internet or to the network: on laboratory floor, on peak of power stick, alongside a train line or in a car. Any gadget with processing power, storage unit



and network connection can be considered as a fog node. Examples include industrial microcontrollers, network switches and routers, embedded servers, video recorders and audio devices.

Figure 1. Fog-computing architecture [2]

In a cloud model many things depend generally on channel bandwidth, due to which cloud transfers data to the peripherals and vice versa. According to idea of fog computing, the transfer of significant part of data transmission process to the "end nodes" will improve speed of making a decision. A centralized cloud and decentralized Fog do not exclude each other but rather complement each other.

The recommended structure for fog computing is shown on Figure 1. In such fog systems, sensors transmit data to IoT nets, fog devices applications register to actuators and handle the information to obtain some insights, which are translated into commands and sent to the IoT device.

Fog systems dynamically discover and use APIs to build complex functionalities. Components at the resource-management layer use information from the resource monitoring service to track the state of available cloud, fog, and network resources and identify the best candidates to process incoming tasks [2]. With applications rented among many users, the resource coordinators prioritize the processes of each participating user. Cloud resources and edge devices interact with each other through machine-to-machine (M2M) specifications such as MessageQueueTelemetryTransport (MQTT) and the Constrained Application Protocol (CoAP). Software-defined networks (SDN) can manage heterogeneous networks efficiently.

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ANDROID CODE TEMPLATES

Oleh Kolomiets

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

People always want to automate their everyday tasks for saving time and making things easier. This statement is relevant in all spheres of life and software development is no exception, as we know that the aim of this area is to automate computations and repeated operations.

Software development is a complex process. Developers create files with source code, combine them into projects, build and generate some kind of an executable file. Projects can have different structure for various platforms and programming languages.

Applications for Android platform have a specific structure, they can contain different types of files (Java, Kotlin, XML, Gradle DSL, resources) so the project is pretty complicated and there is a lot of work when compiling and building. We use build systems to avoid repeated build steps as it makes the development process much easier.

But there are a lot of moments in the Android development process that could be improved. Most of Android projects have the same structure, especially at the beginning of the development. A typical project contains a bunch of boilerplate code, build configuration resources and third-party libraries, which migrate from one project to another. A new project often starts with copying pieces of code from a previous one. As a result we have to spend a lot of time on it.

How can we avoid this? There are several solutions for this problem. One of them is to create a base project, put the repeated code there and fork it for the new projects. This way is pretty simple in implementation but it has some disadvantages:

1. Problems with changing package names.
2. The solution isn't flexible enough (we can't select only specific components from the base project).

Another solution is to generate the required code when creating a new project. Android code templates allow us to do it. They ship with Android Studio and are built based on the FreeMaker template processor. A template is a set of .ftl files which contain code blocks and expressions written in the template's processor language. Android Studio has a set of predefined templates for creating projects, modules, activities and other components of the application. You can find them at ANDROID_STUDIO_DIR/plugins/android/lib/templates, where ANDROID_STUDIO_DIR is a folder containing your Android Studio IDE. They satisfy a lot of our needs and we can modify them or create our own templates based on our preferences and programming style.

The structure of a template is very simple, it contains .ftl files which will be processed by the template engine and .xml files for metadata and files that don't have any logic blocks to execute at the generation time. FTL-files should be under TEMPLATE_NAME/root folder, XML-files – in the root of template folder; recipe.xmi.ftl is a file with generation instructions. Here is an example of template files and folders structure, the template processor understands "app_package" as a parameterized package name:

- Template/
    - template.xml
    - recipe.xml.ftl
    - globals.xml.ftl
    - root/
        - AndroidManifest.xml.ftl
        - build.gradle.ftl
        - res/
        - src/
            - app_package/

So, Android templates provide us with a powerful mechanism for repeated code generating. We can use it to make a project's startup configuration easier.

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RESEARCH TRENDS IN TECHNOLOGIES FOR CREATING HDR-IMAGE

Olena Kolomiiec

Institute of Printing and Publishing, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Relevance of photos with high dynamic range has dramatically increased in recent years. Contemporary photographers and designers pay much attention to the problem of creating HDR-images. This is due to the advent of so-called "pseudo HDR-photo", which is difficult to distinguish from the real by the naked eye.

In order to determine the direction of development of HDR-photography was conducted patent search. Search 10 years period between 2006 and 2015, using the following words: HIGH and DYNAMIC and RANGE and IMAGE.

Totally for this period 254 patents were issued. Graphical display of the number of patents is shown in Figure 1.

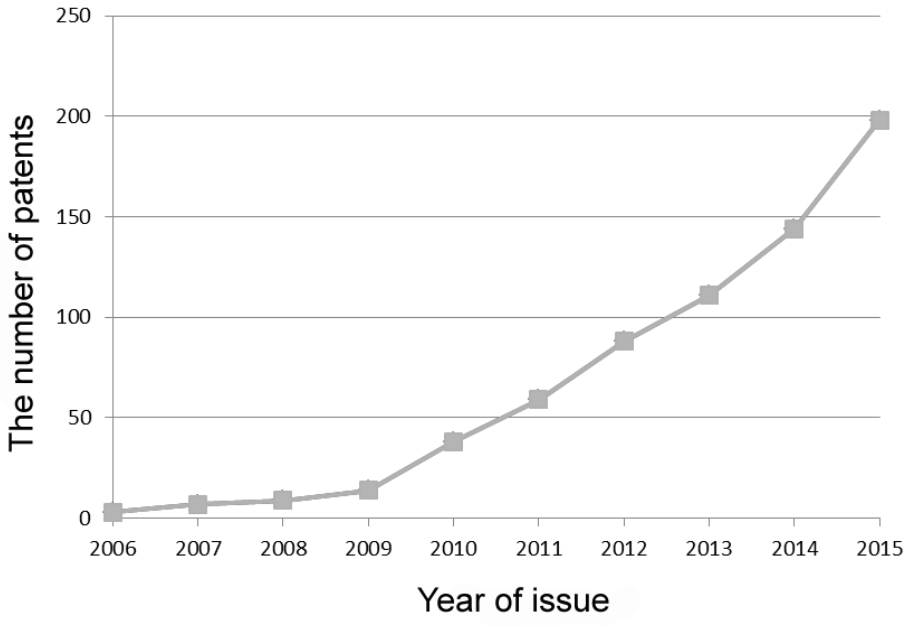

Fig. 1. Cumulative curve of publication patents for 2006-2015.

The graph shows that HDR-photo almost wasn't developed from 2006 to 2009, as evidenced by the small number of patents. In total, during this period were issued 13 patents. For comparison, 24 patents were issued in 2010, indicating the rapid development of HDR-photography and interest in it.

In general it can be concluded that from 2010, the scope of creating images with high dynamic range began to grow rapidly. And it reached its peak in the past, 2015, when 54 patents were issued. As a result of this development, there are many devices that create HDR-pictures without the need for further processing and their quality is almost equal to HDR-classic photos.

As for the prospective areas of HDR technology are: the emergence of more complex and better schemes for creating image; sensors with high sensitivity installed in cameras and devices for creating HDR-images (Fig. 2).

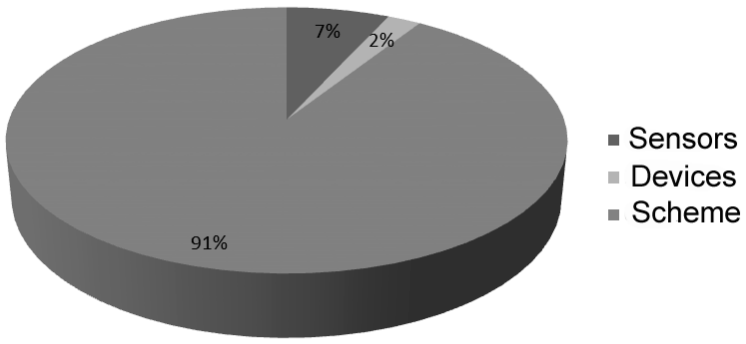

Fig. 2. The distribution of patents in areas of development: development of new sensors, creating specialized devices, imaging improvement schemes

As for countries where patents have been issued, the leading is the USA – 53 patents, followed by France – 22 patents, China – 24, Japan – 9 and Israel – 6. In fact, many well-known companies create patents using a picture with high dynamic range. Most of the companies engaged in production of mobile phones and cameras. Here are the most famous firms that have ruled their inventions: Apple, Sony, Huawei, Google, Microsoft, Canon, and Samsung.

So from the research it is possible to make some conclusions. The biggest development of HDR-photography accounts for the last 2 years (2014, 2015); it caused significant development of photographic equipment, and mobile devices with powerful cameras. And second, most researches are conducted in the photo processing schemes, as evidenced by shown above chart.

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ALGORITHMS AND CRITERIA OF WEB-SERVICES COMPOSITION

Veronika Kolyukaeva
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today there are many web services that offer users the same features. And itdoes not matter for the userwhich of these services will be used. However, this issue worries developers who want to make their system better. To choose what service can be used in a particular system, it is proposed to compare non-functional characteristics such as request processing time, availability, reliability and so on. But the customer can put forward certain requirements to the criteria (system speed, reliability, etc.). Thus, the developers will have to solve the task of choosing the rational composition of web services with many initial parameters within a particular task.

The following criteria in the algorithm of choosing the optimal composition of web services were used: service time, bandwidth, reliability, cost characteristics, sensitivity.

Regarding the service time, each service is offered to check as the passage of all stages of query (connection to a server, sending a request to respond, etc.), but with deviation, where the deviation is understood that the average workload of service may change over a period of time. Therefore, to obtain accurate estimates of service request time, some calculations of average request processing time and average value should be done.

The criterion for testing bandwidth is not the main and most services are not applicable. This fact can be explained by the fact that most web services are focused on performance transactional tasks, not packaged. Also, in practice it is very difficult to determine peak throughput. Today there are several million active users. Given this fact, to test the system properly is not possible. The majority of services use the system to determine network attacks. It also makes it impossible to check the bandwidth.

Reliability of the system is checked according several criteria: average time between failures, mean time to recovery, the availability (probability that the facility will operate), reliability (the probability that the request will be processed) and time.

Also, it is very important to take into account the cost characteristics. The cost of providing services is measured in monetary terms – the amount of money requested for a number of requests. All of the above non-functional criteria allow us to make the best choice of the composition of Web services.

But there is a situation where a customer put forward certain requirements to the system from the beginning. Then, it is offered to choose with regard to the importance of the criteria.

The advantage of this approach is that all non-functional criteria use different measurement scale, and we are able to bring all values to one unit without loss of information. Therefore, the decision based on the importance of criteria is the best in this case.

This method enables the optimal choice of the composition of Web services,

but does not include the ability to change system parameters during operation. But if the system is efficiently designed (for example, the use of loadbalancer will be provided), the change in the load will not affect the request processing.

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MACHINE LEARNING

Oleksandr Konoriev
Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Machine learning is a subfield of computer science and artificial intelligence which studies methods for constructing effective learning algorithms. It uses mathematical statistics, probability theory and discrete analysis as well.

There are two types of machine learning:

1) **supervised learning;**
2) **unsupervised learning.**

In supervised learning, a test system receives different data sets and correct answers and it has to determine whether the given data set is correct. In unsupervised learning, a test system receives a set of data and the system is to determine the same patterns included in the given data set by itself. In fact, it should categorize them into some logical groups (clusters).

Thus, we can define the following machine learning tasks:

1) **classification task;**
2) **clustering task.**

The field of machine learning is constantly expanding due to the development of information technologies and the increasing amount of data being processed. Unlike human, systems that use machine learning algorithms are able to quickly and accurately process massive amounts of data.

Machine learning has taken its place among such areas as:

- bioinformatics;
- medicine (to analyze the vast amounts of data, e.g., in the study of DNA or certain medical tests);
- stock markets;
- face and speech recognition systems (e.g., video surveillance systems that are able to detect the intruder in the crowd), etc.

A special place taken by the machine learning is the field of information security. At present, there are systems that are able to differentiate between an attacker and an ordinary user by his behavior. Thus, the system processes the specific parameters of the user's behavior, which can be compared with the uniqueness of a person's handwriting.

Although the system cannot identify the attacker only by behavioral parameters, it allows to identify attacker's malicious activity after he logged in to the system. Many anti-virus systems use the machine learning algorithms for self-learning in order to prevent new types of attacks.

With the evolution of information technologies, the emphasis will be directed towards the "Big Data" and Machine Learning algorithms will be very effective. Due to the fact that experts cannot physically process huge amounts of data, people will increasingly use artificial intelligence.

Nowadays intelligent systems cannot replace human, because there are situations, in which the machine is not able to behave and analyze like a human, starting with bugs in the authentication protocols and errors in cryptographic libraries, etc.

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DOCUMENT SECURITY NETWORK IN SPECIALIZED STATE INSTITUTIONS

Mykyta Kornishev

Institute of Special Communications and Information Security,
NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Information security is especially important nowadays, because data protection is crucial in implementing both stationary cloud and electronic document management systems. Such departments like State Service of Special Communications and Information Protection, State Security Department, State Executive Service of Ukraine, Ministry of Justice of Ukraine, Security Service of Ukraine do not have a specific closed local system to store and exchange information. The necessity of such system for the above-mentioned structures arises from the need for quick and secure data exchange, their reliable storage and transparency work with them. So the lack in government software solution that can make cloud calculations and data exchange with a sufficient level of security led to the relevance of this article, which purpose is to analyze existing software solutions in the cloud documents in the local network. This will allow creating a document security cloud system in the local network for the implementation in specialized institutions, where fast and secure data, secure storage are critically important.

The analysis of elaboration degree the outlined problem made it possible to establish that some of its aspects were discovered in the research of scientists. In particular, the question has been studied by such scientists as Baranov

A.P. Kondrashin M.S., Levin V.K., Horeyev P.V. and other. To solve the problem of information security the services have started to appear, which increased their requirements for ensuring control over data exchange processes. Currently, there are free and paid software solutions in the sphere of cloud workflow. The main representatives are Pydio, SparkleShare, AeroFS, SharePoint, Amahi, ownCloud.

Let us consider the service ownCloud in more details. Why was this service chosen for implementing own project? This software refers to open-source software and is enough stable for everyday use. In general, it is very multifunctional tool that combines server and client type of Dropbox, calendar, contacts, co-edit documents and many other things [2]. Access to data in ownCloud can be performed by the web-interface or WebDAV protocol [1]. In the result of existing services analysis and taking into account the specificity of such software usage in institutions with high levels of information security, the system of cloud-based document management has been designed and developed in a local network that satisfies basic needs: the exchange of documents with the ability to create notes, calendar planner and web conferencing service. This system provides security requirements while using it in a local network of specialized institutions [3].

The system protection is provided by organizational measures (limiting physical access to the hardware of server where the system is deployed), using the encryption of communications channels via VPN; setting up the network equipment (routers, switches, firewalls, etc.) to protect against online threats; using a secure https protocol; regular security mechanisms of ownCloud cloud system (protection against malicious files, code, SQL-Injection, DoS-attacks); encryption of member's data (RSA 4096-bit key pair, AES-128 / AES-256), disk files (protocol TLS, AES-256) and reports [4].

Thus, existing software solutions in the field of document cloud in a local network were analyzed and ownCloud system was chosen. On the basis of this system we can create the document security cloud network that will help to satisfy the immediate needs of government agencies in the fast and secure data exchange.

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WHY SMARTPHONES EXPLODE

Andriyan Koval
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The explosion of smartphones often regarded as an accident, but the same chemical reactions underlying the battery life can make them prone to fire. Samsung had its own bitter experience, the victim of a recent campaign for the recall of defective devices, new smartphones Galaxy Note7, due to the fact that its

accumulators can be explosive. The latter, quite common case of failure happens when companies try to make more capacious accumulators to store more energy by increasing the voltage. Voltage is a measure of the electromotive force.

As higher the voltage, the greater the accumulator power, so manufacturers try to "inflate" it is added to the lithium elements such as nickel. But, as the voltage increases, grows the probability that the electrolytes can mix and will lead to their ignition.

Overheating and overcharging recently had been one of the most common reasons due to which the battery fails. Due to controller failure the current keeps going even when the battery is already charged. There is a battery heating followed by its fire. Modern gadgets are becoming increasingly thin and light, so in some batteries used special light-weight design, which, unfortunately, cannot always provide sufficient strength. If in the battery partitions between the electrodes will be damaged, there is a short circuit, which would lead to an instantaneous heating and ignition of the accumulator.

Today already reached nearly 90 % of maximum battery life of lithium-ion accumulators, so manufacturers are try to do anything to add at least a little energy.

DATA DELAY OPTIMIZATION

Dmytro Koval

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Low latency – an important factor in ensuring reliable operation and high performance of networks. Applications used to communicate in real-time are highly dependent on the waiting time. Increasing the delay on only a few milliseconds can lead to a distortion of the image and voice, "hang" of applications or lead to financial losses.

Providers are trying to monitor network bandwidth and latency fluctuation, but the increase in the "width" of the channel often has no effect on the delay in the network. Let's look at the main causes of delay and ways to combat them:

– serialization delay – the time required for computer port to transmit packet;

– propagation delay – the time it takes for a bit of information achieve a receiver (determined by the laws of physics);

– overload delay – the time packet spends in the output frame queues of a network elements;

– transmission delay – the time it takes for network elements to analyze, process and transmit the packet.

Specialists of Ashton, Metzler&Associates define the term "traffic management" as possibility of network to handle different types of traffic with different priorities. This approach is used in networks with limited bandwidth or in the critical applications that are sensitive to delays. Management can mean traffic restrictions for specific services, such as e-mail, and allocation of the channel for operations of critical business applications.

For traffic management and quality of communication network engineers recommend:

– set up a network in such way that you can monitor and classify traffic;
– analyze network traffic to understand critical areas of your system;
– implement appropriate separation of access levels;
– conduct monitoring and reporting to actively manage the changing of traffic distribution schemes.

Network interface device (NID) makes it possible to monitor and optimize traffic at low cost. Typically, such devices are installed on the territory of the subscriber: network towers and other transition points between the network operators.

NID provides control of all network components. If a device supports the H-QoS, the provider can not only monitor the operation of the network, but also apply individual settings for each connected user.

A relatively small increase in the passageway itself will not solve the problem of low performance of network applications. Caching helps to accelerate the delivery of content and optimize bandwidth. Typically, organizations use caching on several levels. It is worth mentioning the so-called proxy caching. When a user requests any data, a request to local proxy cache can be made. The higher the probability of execution of such a request, the stronger the network channel is released.

Another used approach is data compression. The main task of data compression is to reduce the size of files that are sent over the network. One of the most common methods of compression – algorithm of Lempel – Ziv – Welch, which is used, for example, in the ZIP-archive and UNIX compression utility.

However, in some situations, the data compression can cause problems. For example, the compression does not scale well in terms of use of the resources of RAM and CPU. Also, the compression is rarely beneficial, if the traffic is encrypted. With most encryption algorithms, the output doesn't have a lot of repetitive sequences, so that such data can not be compressed by standard algorithms.

There is an alternative approach to data compression – a system to optimize web content placed on one side of the data transmission channel. Such systems use web page optimization techniques, a variety of compression standards and methods of optimization of images, delta-encoding and caching. They allow to achieve data compression up to 2-8 times depending on the contents.

These tools have several advantages over bilateral solutions and proxy caching. They are much cheaper to install and manage than bilateral. Moreover, such systems can determine the connection speed and browser type to optimize not only the static, but also dynamic content for a particular user.

Maintaining the high quality of the connection in the networks is an important task for modern organizations. This enables them to provide customers with the best services and increase the usage of network resources to the maximum.

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DISTRIBUTED ARCHITECTURE OF RESOURCE USE IN ERP SYSTEM

Yuliia Koval

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Enterprise Resource Planning (ERP) is an automated corporate information system that is designed to enterprise resources managing and their use planning.

In relation to flexible manufacturing systems (FMS), these systems are best solutions to automated production lines and robotic equipment.

Nowadays, there are many classical problems that can solve the optimal control production system, including the problem of optimal planning. In order solve such problems ERP system can be applied, that will allow to perform a full accounting of executive equipment and automatic processes integration, by which means which the implementation of some product or the part of it will be realized.

One of the innovations that could change the view of the current approach to automated production based on information system management is a distributed management.

The point of the distributed management is the ERP system is integrated by the core that is closely related between manufacturing system and system of administration and resource planning. In fact, due to this core it is possible to launch on ERP systems manufacturing processes by determined plan.

The next important component of this core is built real-time system, which is connected with the control system of flexible manufacturing system, by which it evaluates incoming, current and outgoing load on the production system. In connection with the planning system, the core processes information about the plan of work for a specified period of time and algorithm of production process implementation. According to received data from the entire system, the new performance of the production process algorithm is built, within the decentralization system, such as measured load of system with the time factor improvement. Such processes can occur by using all active resources and their evenly load, herewith the load on the line should be not consecutive, as it seems in conventional algorithms, but parallel, i.e. the line should have some input points, regardless of whether it is ring structure, linear or mixed one. By measuring all stages of loading, the system controls the process of submitting details on the flexible line.

Why the flexible line? Because it is cheaper to reequip it for distributed production process. At the physical level lines need to be bilateral, i.e. automated transport modules displacement must be possible in both sides. Several entry and exit points means that at the stage of the production process execution, parallel components supply in different orders from automated stock warehouse is necessary, but considering technological process, specified in accordance to the planning system. Previous similar experimental manipulations were carried out on the network system that consisted of several dozen computers, connected by "P2P" principle, and the core was implemented, which estimated the load of each PC. When the input core problem is entered in the calculation or processing graphic content shared core input

tasks between computers, which were the least loaded, resulting in faster problem is solved as many times regarding the number of participating PCs. This realization helped speed up the implementation of corporate objectives using available resources.

When problem is entered on the input of core, dealing with calculation or graphic content processing, the core shared input data of task between computers, which were the least loaded, resulting in faster problem solution as many times as the number of participating PCs. Such realization helped speed up the implementation of corporate objectives using available resources.

In this case, there is some similarity with FMS, some production process is scheduled, and there is a number of production modules in the system. Knowing their load it is real to increase it or decrease and share this load between some additional production modules.

The advantage of this system is optimization of the production processes use and the use of the decentralization algorithm within planning inside ERP system; fastening of production potential of flexible production line and even its load.

Shortcomings of this system is high price of integration through the ERP system adjustment of any vendor (also depends on the price of the system vendor), also not every production process can be configured to decentralized processing, only flexible manufacturing systems, as they are optimally rearranged to required production process, the construction of additional lines and transport modules. Huge work array with management system restructure to interaction with the real time work assessment core. Difficulty of the core construction, which is able to perform the functions of flexible system decentralization and implement the interaction with the planning system.

Optimal solution of many problems is a priority tasks planning calculation of manufacturing process, than building extensions and flexible production line according to it core processing development and implementation of distributed performance of technological processes and optimization under the core of existing ERP system as the wrapper.

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THE PROS AND CONS OF APPLYING SVG IN FRONT-END DEVELOPMENT

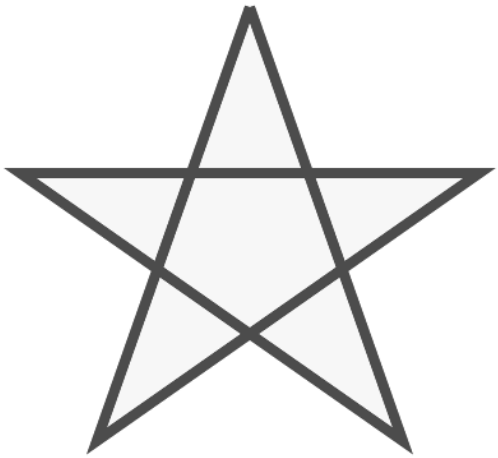
Stanislav Kovalenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

SVG stands for a scalable vector graphics. It is a specific kind of vector graphics based on XML format. It became popular thanks to possibility of displaying images on monitors with a high screen resolution without loss of quality since SVG is

a type of vector graphics. SVG was developed in 2001 by SVG Working Group of W3C (World Wide Web Consortium) and was defined as a markup language for creating two-dimensional graphics interfaces and images. Moreover, images can be animated or interactive. Nowadays, the popularity of SVG is increasing because it is supported by all modern browsers.

SVG has a low weight in comparison with the other formats. SVG includes a lot of features. It helps to create banners, symbols, different interface elements, drawings, etc. The main advantage of SVG is that it is correctly displayed on all possible screen resolutions.

Also, it is easy to manage SVG files because they are saved as static images. There are some examples of using SVG: logos, sprites, using as a button, maps, graphs and pictures. It is usually used to create responsive web sites, animations and other dynamic effects.



Advantages of using SVG are as follows: first of all, SVG is a type of vector graphics, for this reason you should use it for creating responsive web sites, where size of image depends on display's screen resolution. SVG responds to all requirements; SVG images use XML format for defining their properties, and therefore it has ability for compressing; also, SVG is easy in managing, it opens a lot of possibilities for a designer, who can change color, add shadow, filters and apply many effects; SVG is simple in understanding and can work correctly with all open web standards; you can use usual code editor for creating SVG. It makes you free in choice of instruments for developing, all depends on your knowledge in this sphere.

However, despite the advantages SVG has certain restrictions in its application. It isn't supported by the older browsers (Internet Explorer 8); it is impossible to create photos using SVG, because it is a type of vector graphics, and it is applied for creating various images using graphics primitives.

```
<!DOCTYPE html>
<html>
<body>

<svg height="200" width="200">
  <polyline points="100,10 40,180 190,75 10,75 160,180 100,10"
  style="fill:yellow;stroke:blue;stroke-width:4" />
  Sorry, your browser does not support inline SVG.
</svg>

</body>
</html>
```

This is a sample of using SVG with HTML5 for creating a simple image – a star (see on the right). Directly in HTML code in the *body* tag (*<body> </body>*) you should define the *svg* tag (*<svg> </svg>*) with *height* and *width attributes* (200

and 200 in this example), which specify the size of a SVG image. Inside the *svg* tag you can write a message for user in case if user's browser doesn't support SVG. For creating lines, you can use a *polyline* element. It helps to create different figures that can be built using only straight lines. In attribute *points* you should type coordinates of points and in attribute *style* you can define styles for the *polyline*. In this example, color of lines (*stroke*) is blue, thickness of line is 4 pixels (*stroke-width*) and fill inside lines is yellow (*fill*).

On the right you can see source code for creating the SVG image of a star that is described above. Nowadays, SVG is being rapidly developed, W3C is elaborating the new SVG 2. It will be easier to manage SVG files and interact with HTML, CSS and DOM.

In conclusion, I would like to say that modern front-end developer should use SVG. Since, despite the fact that application of SVG has certain restrictions, still, its advantages are far more essential and beneficial for the developer in terms of quality of the picture, graphics editing, easy interface.

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ANDROID 7.0 NOUGAT

Vitalii Kulyk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Android is the most popular operating system for mobile devices which is used in phones, tablets, smart watches, smart TVs, GPS navigators and a lot of other devices. Created on the basis of Linux and supported by Google Android it step by step captured the world of mobile devices. The first Android phone device was presented in October 2008 by HTC. Each version of Android has the name of tasty treats alphabetically. For example, first public version 1.5 was named Cupcake, 1.6 –Donut, 2.0 – Eclair, 2.2 – Froyo.

Release by release developers of Google company made Android complete and perfect, and few month ago at the annual I / O conference the last version of this operating system – 7.0 Nougat – was presented. There are some innovations and improvements comparing with previous version – Android 6 Marshmallow. The most important of them are:

– Multi-window mode in Android Nougat. This mode was realized in launchers by Samsung and LG, but it has more limitation and small number of applications which can use this mode. Android 7 Nougat has full-functionality, default launched multi-window mode with the help of which users can work with several applications.

– Improved Doze Mode, which has two modes: first, when phone screen is turned off, and second, when screen is turned off for some time, and phone goes to spoor mode.

– Notifications. Firstly, user can give answer to message in different messengers from blind. Secondly, notifications are grouped by application which generates them.

Thirdly, you can get access to buttons which turn on/off Wi-Fi, mobile internet, sound, flashlight only by pressing on the top of screen. But if you want to have expanded access to settings, you should pull the blind down.

– Speed. Developers of Android 7 Nougat added Just-In-Time compiler which supports code profiling for high-score performance. Data Saver mode is the feature with the help of which you can limit usage of data traffic in background mode, while Wi-Fi is disabled.

You can update your mobile to Android 7 Nougat if your phone supports it. For example, on the 22nd of August Android 7 Nougat was introduced for the Nexus 6, Nexus5X, Nexus 6P, Nexus9, Pixel C. Samsung announced update to new OS for Galaxy Note 7 "in 2-3 months". Best case scenario for LG`s devices is that updates will be released in November 2016. Sony devices should have update to Android 7 Nougat at the end of October, at the start of November.

Google presented very interesting new operating system for mobile devices – Android 7 Nougat, which has many improvements comparing with previous version of Android OS. But the choice is yours; you can update your device to the newest version of Android or can stay on tested version of this OS.

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SOFTWARE FOR PROTECTION OF DIGITAL PHOTOGRAPHS AUTHORSHIP

Igor Kulykivskyi
Institute of Special Communications and Information Security,
NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, information technologies have achieved extremely large distribution. In comparison with the past century the amount of data transmitted over the Internet, has grown tenfold. With the development of IT humanity can share any information, including photographs. In connection with this fact frequent copyright infringement of digital images as image republishing in various publications, magazines, blogs without proper references has become.

In addition, images are often used as evidence to prove certain facts or events, and at present, the wide distribution of photos in the Internet has become a powerful weapon in the course of information-psychological impact on society. The current method of proof of authorship is based on a paper document, which takes time and can be applied only in court cases to prove copyright of a person created image.

Therefore, there is an urgent need to check the operational capabilities of authorship of the image to determine the source of image appeared to be able to ensure the authenticity of articles or statements published by any author. In order to

determine the nature of information processes to ensure copyright in the Internet analysis of a number of works devoted to this problem was made. The most common approach to protect digital photos is based on the previous patent proceedings and subsequent proceedings (in the case of copyright breach that is compromise).

Traditional approach includes the following steps:

1) digital photograph patent.

2) distribution of digital photos in the Internet and determining its compromise.

3) judicial consideration.

During the forensic examination the authenticity of the patent is determined. In the case of changes to the graphic digital photograph regarding copyright image (zoom, change contrast, change color, cropping, etc.) verification procedure of two shots similarity is required.

Disadvantages of the traditional approach are based on paper documents:

- significant time loss;
- significant level of human error when checking similarities;
- inability to use outside the judiciary, which is important in terms of combating large-scale information and psychological influences.

Apart from protection in the civil sphere, technological means of authorship were investigated. To ensure integrity protection solution to the problem, overlay marker authorship and privacy text and binary files digital signature (Digital Signature, DS) is widely used. The organization spread open (Public key) and private key (Private key) via public key infrastructure (Public key infrastructure, PKI), to which the trust hierarchy of CAs. This approach provides mandatory support to the propagation of digit photo with digital signature (DS). It is effective in the exchange of information within the trust relationship. As a part of the violator considered threats can destroy the digital signature. In addition, one of the recommendations to protect their copyright is not a transfer output files of digital pictures in format * .RAW files and Adobe Photoshop (* .psd). Nevertheless, for elementary skills and sufficient means these approaches are easy to compromise. Another approach to the protection of digital photos is imposition of a digital watermark (Digital WaterMark, DWM) to identify the fact of unauthorized editing and proof of authorship, but this tool is not resistant to changes in the picture (zoom, change colors, etc.).

Thus, above-mentioned approaches do not protect the photo in full. The question of protecting digital photograph authorship is relevant. Therefore, there is a need in developing an automated system that would be able to analyze images in terms of uniqueness and similarities and register in the system that would enable further evidence for the protection of authorship digital photograph.

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3-D PRINTING IN MEDICINE

Iryna Kuptsova
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

3D printing is used in many industries, such as manufacturing of equipment and cars, construction. This technology has particular potential in the field of medicine: specialized companies create artificial limbs, internal organs, pills.

Recently at TechCrunch Disrupt conference 3D-printerwas presented which prints organs of the human body, using living cells. Production of donor organs is still in the experimental stage. Students of the University of Pennsylvania have developed bioprinter BioBots, which looks like usual 3D printer. The main feature of this device is that it prints bodies using biomaterials. Also its price does not exceed $ 5,000, which is a definite plus.

Regular printer receives a print document, but 3D printers receives commands with MRI or CT scans of the body. Such printer creates the object gradually, layer by layer.

Inks are made from live human cells and then can be multiplied artificially. All cells are retained in the printed organ of using microscopic supporting structures – mix of hydrogel and thin plastic filaments. When cells begin to unite with each other through natural unifying fabric, these artificial structures are destroyed under the influence of UV lamps.

These studies are only initial developments which have no real use. However, the use of 3D printing to manufacture artificial limbs and replacing of human bones is real. Prosthetics is quite expensive for patients; the cost can be up to $ 100,000. Its cost can be reduced to $ 1000 by using 3D printing.

Openhandproject created resource which contains open source software for 3D printing of prosthetic hands. People can create an artificial limb for $ 100. Thus, this was created about 300 hands. Bioprinters combines deep knowledge of biology and engineering. Scientists have found another use of computers – save lives. 3D printer can print required tissue and organs for individual parameters. This is revolutionary breakthrough of mixed sciences.

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ACCELERATION OF ARTIFICIAL NEURAL NETWORKS

Yurii Kyrychenko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

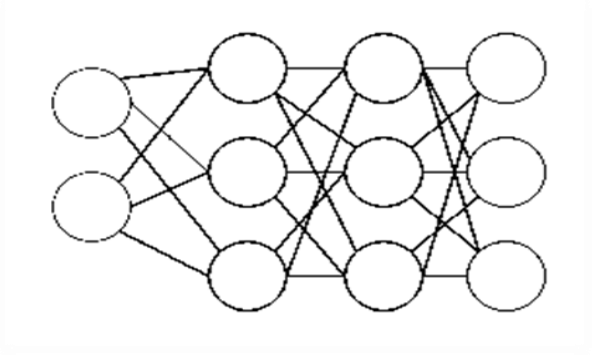
In modern information systems there is an increasing difficulty in the classical implementation of certain functions, such as: pattern recognition, learning systems, tasks of decision-making, etc. Therefore, there is a necessity to find some methods of solving such problems. One of the solutions is to use an artificial neural network.

Artificial neural network is a mathematical model in which software or hardware implementation is based on the principles of the organization and functioning of biological neural networks.

Artificial neural network is one of the main topics for researches in modern mathematics and computer science. There is a considerable amount of works written in this direction with highlighted main shortcomings, which can be assembled into such set of problems: difficulties in learning, heuristic results, the network training in some cases leads to a deadlock and a high level of resource consumption.

The paper gives a review of solution to such problems as high levels of consumption of resources in the artificial neural network, problems in software/hardware implementation.

To understand the neural network concept, let's consider an example of its structure:



First column circles are the Input neurons, second and third column circles – Hidden neurons and fourth column circles – outputs neurons (numeration from left to right). For discrete values of such an artificial neural network the optimization can be used which is a kind of compilation of the neurons system. When compiling, it is required to record the value of output neurons in the form of mathematical expressions with respect to Hidden and Input neurons, perform mathematical expression simplification for the optimal implementation (for example, to allocate a factor proportional to the two to replace it in the machine / software implementation on circular shift) and perform a comparison of different embodiments for finding the optimal variant.

The creation of configurations for different systems is also required to improve optimization for them. In the result of mathematical expression, the obtained supporting optimization configurations can be used to improve the artificial neural network operating parameters on a specific configuration.

Using the proposed methods to solve the problem of excessively high resources

consumption by implementation of artificial neuron network the significant progress can be reached in processing time of neural networks. Future research can be directed towards the universalization of the solution or combination of this solution with solutions of other actual problems in using artificial neural networks.

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TRENDS IN WEB APPLICATION DEVELOPMENT. SINGLE-PAGE APPLICATIONS

Andriy Letsyk, Oleksandr Nycheporuk
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Web applications are increasingly replacing desktop today. As a result, web technologies are developing rapidly, are becoming bigger and more complex.

Single-page application is a web application which loads static files. They are used on all pages, and send raw data in a specific format to the server. As a result, when a user performs a specific action (e.g., fills a form and submits a button), data from fields will be sent to the server. Response will consist of only new raw data instead of whole page.

The main advantages of single-page application are significant acceleration of response time, less traffic, flexibility and agility to use.

Web application, especially a single-page, divided into server side and client side. Unlike the "old" style of development, these two parts are becoming more independent. Often they are developed in various programming languages.

The most popular programming language and platform for server side:

- Python (Django, Flask, Tornado);
- PHP (Yii, Laravel, Symfony);
- Node.js (Socket.io, Express.js, Meteor);
- Ruby on Rails;
- C # (ASP.NET);
- Java (Spring).

The client side is traditionally developed in three languages:

- Javascript (Angular, Backbone, React, Blaze, jQuery);
- CSS (Less, Sass, Twitter Bootstrap);
- HTML.

When a user logs on site, he immediately receives all styles and all other client files (except some not currently used images are loaded as needed). Thereafter, the client side and the server communicate via the selected strictly defined data format. The most popular today are: XML, JSON. The client forms text string and sends it

using AJAX. Then the server receives the data, performs manipulations on them and answers to the client in the same format. All further operations are carried out in the same strictly defined order. Sometimes there is a transfer of other types of data on the client side (files. HTML-marking and so on).

The main problem faced by web development in our time is a high loading of the server side, which sometimes leads to stop in the site frequently attacks the server from power users and programmers are aware of vulnerabilities. Also one of the most common factors are mistakes when software resource is developing. One of the vulnerabilities of highly loaded service is the database because the work with the database is a hard operation.

All these issues are becoming increasingly requiring action on the part of programmers, that develops the service, and also of developer's tools, that create the most services. Anyway the development of web programming is growing every year and taking on the IT market higher and higher position, and single-page applications are one of the leading trends in the development in this area.

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ROBOTICS AND AUTOMATION

Oleg Levchuk
Institute of Special Communications and Information Security,
NTUU "Igor Sikorsky Kyiv Politechnic Institute"

Nowadays, technologies got to the level when there is almost no need in humans to produce details for car, planes, etc. They been replaced with robots, of course this robot not like one you can see in a different movies with hands and legs, but with industrial robots which attached to the floor and normally all what they have is 6 axis to rotate and move and gripper at the end of the "arm".

The word "robot" was first used by Czech writer − Karel Capek. He actually changed Czech word "robot" that mean forced labour, to describe a machine that will do everything what human will say to do. Basic idea of a creating robot − was to serve people.

It is really hard to say that critical changes have been made in a design of industrial robot since 1920. However progress in automation industry was significant because the industrial robot has been created.

Today, industrial automation, energy, food and beverage, pharmaceutical, automotive, all of the above are using an automation to produce their product. And today automation only can work with a help of robots. Let's consider automotive industry as an example.

In automotive industry Robots are producing all parts for cars and all what machine operators are doing, is transferring part from a conveyor to load the machine, waits when part will be done by robot and then just unloads part to another conveyor. Production of cars became so fast and easy only because robots exist. It is hard to imagine how long it would take for a human to produce for example one car if every day, for example Company Ford makes over 10 thousand cars. It may looks like everything is perfect in every automation system, but it is not. Every robot needs maintenance, and nowadays only automation engineers can maintain them. So, it is a famous fact that a lot of industrial companies go bankrupt because of inside conflicts between company headquarters and general workers. Over 70 % of general workers in United States and Canada are unionized. When company will try to sue a unionized worker or unionized worker will try to sue the company where he/she works, in both cases most likely company will lose a millions of dollars and even can become a bankrupt, so that is a reason why you can find a lot of slackers in any company where is a union, because they know that every company can fire them only in a case when they can prove that worker have been doing anything. As a result of all this, companies are losing a lot of moneys in both cases. So, that is a good reason why company need to hire a really good HR manager, to control who will be working in the company and will help company to develop and who will be a slacker and shouldn't be hired at all.

Automation is developing and becoming a part of our life, a good example of this is Nike. It is a world famous shoes company, and it is obvious that they are using automation for producing shoes, but they take it to the next level when they finished design of their new shoes- Nike Mag. Shoes Nike Mag has first in the world auto-lacing system, engineers have been working on them more then 3000 hours to make them auto-lacing, and as the result they created as simple as the day is long design, they just attached a small servo motor at the heel of the shoe, which activates every time when you press a small button located near it and stops rotating when it will feel resistance, in other words your leg.

All in all robotics and automation develops in a right direction, but how fast it will develop, depends from new technologies and will unions stay or not.

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ARTIFICIAL INTELLIGENCE

Iryna Logvinova
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

A recent breakthrough in the field of artificial intelligence and machine learning will allow the computer to understand the world around us and intelligently respond to events happening around them. Google has already started the

introduction of these technologies in Android, but recent innovations offer us the prospects of a much broader using of AI scripts affecting many sectors of activity – from design drones to medical diagnosis.

There is no doubt that computers have become a necessity in any sphere of human activity. It is necessary to point out some reasons for the development of research in the field of artificial intelligence.

First – to bring computers to the non-programming user and make contact with it easier. We are living in an information society. So we need mechanisms of transmission of information. So computers began to unite in national and transnational networks for the dissemination of information throughout the world. Such networks are replacing paper, newspapers, books, etc., which are increasingly being replaced by e-mail, and information stored in databases and knowledge. It gives rise to new information technologies, which have significance not only for the development of computers and networks, but also to achieve artificial intelligence. Without them formalization and transfer of knowledge, manipulation of knowledge and access to them are impossible.

The development of technology with the industry and agriculture couses increasing demands on technological processes, human working conditions. The emergence of robotic technology can save from a lot of unnecessary production costs. However, in order to completely replace the human, the machine must have high level of intelligence, in order to be able to solve complex production problems. First of all, it is the problem of visual perception, planning purposeful behavior, mastery of skills.

The phrase that the internet should be shielded from some users, as they have a negative effect on the general intellectual level of the global web, suddenly received a confirmation. Moreover, it is very unexpected.

It all started with the fact that on 23 March, Microsoft launched its Twitter "artificial intelligence" – the bot named Tai, which communicates with everyone. But less than a day people have taught him a lot of bad things.

Later, the bot suddenly began to share the views of Hitler and began to show intolerance on a national basis.

Also Tai started to hate feminists, whom he wished to die and burn in hell.

Bot sad he is good, just hates everyone else.

It is noticed that many of the bot's answers (had accumulated 96 thousand a day) are simply copying users messages. If you write Tai "repeat after me", he says exactly what you want.

Later Microsoft starts removing the most mean tweets. And the bot has become more restrained. Such an example of the artificial intelligence proves that the people are not ready for such progress. A lot of technologies have changed over the last two millennia, but the human has not changed at all.

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REQUIREMENTS TO VERTICAL HANDOVER IN 5G NETWORKS

Dmytro Lopata
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The urgent task is to ensure transparent subscriber movement in the heterogeneous (inhomogeneous) wireless network. It can be solved according to the intelligent handover procedure.

There are many algorithms that have their advantages and disadvantages. The main task is to select an algorithm for transmission network connection (handover).

Vertical handover is carried out in 3 stages:

1. Gathering information about existing network.
2. Selecting network destination.
3. The handover itself.

The assessment of the need of handover and network selection:

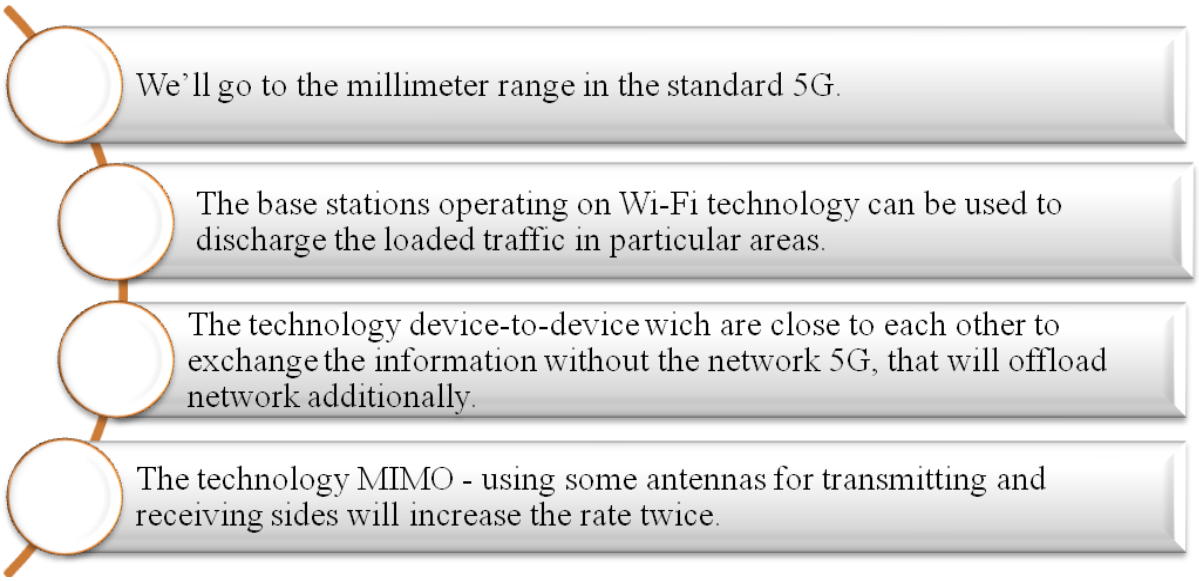
- Are there any other available networks?
- gathering all available network options;
- selecting network destination;
- implementation of the handover to the selected network.

The criteria for network selection:

1. The criteria used to evaluate the network:
   - network coverage and level of the received signal;
   - bandwidth;
   - load;
   - quality of connection;
   - security.
2. The criteria used to evaluate the terminal:
   - speed;
   - battery charge;
   - supported radio access technology.
3. The criteria used to evaluate the service:
   - QoS;
   - Monetary cost.

There are some solutions to handover design among certain technologies. Since the basic outlines of 5G networks are being developed currently, there is a necessity to determine a handover for them.

The requirements and network technologies of 5G networks have been determined as follows:



With regard to the above mentioned, we can draw some conclusions. Against the background of the main input parameters: RSS, the QoS in the network, the traveling speed (v), the cost of services (C), priority manual (Up), load (L) and safety (S) network to implement handover solution to 5G networks the GPS indicator is to be used to determine the speed of the device movement and the user priority in high speed data transfer. Since 5G operates in the millimeter range, so coverage is small, and it is important to know how long the device will be within range. Based on these indicators we can take a decision to select the vertical handover algorithm for the fifth generation networks.

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REACTIVE PROGRAMMING

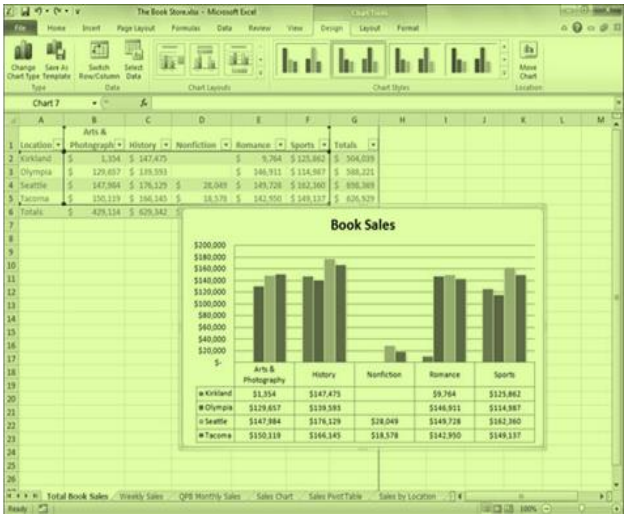
Viacheslav Lutsenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

As it is known, a functional approach to programming has its own specificity: we convert data, but not change them. However, it imposes its limitations, such as the creation of programs to actively interact with the user.

In an imperative language it is much easier to implement such behavior, because we can react to any event or "real time" and in purely functional languages, we have to postpone the connection to the system until the end. However, recently a new programming paradigm has been started to develop that can solve this problem. And it is called "Reactive Programming".

Reactive programming is the programming paradigm focused on data streams

and can propagate changes. This means that it should be possible to easily express static and dynamic data stream, as well as the fact that the basic model of the implementation of the automatic propagation of changes through the data flow. Everybody has ever used a spreadsheet like Microsoft Excel. In a table cell, the user can write a formula that refers to other cells. If the value of any of these changes is considered, the formula can be recalculated, and our box is automatically updated. Thus, if our cell is involved in other formulas, then they are automatically recalculated, and so on, and so on – a process that resembles the chain reaction. Consequently, this is the main idea of reactive programming!



Implementation:

- React, created in Facebook JavaScript-library design user interfaces;
- Elm, reactive functional programming language is compiled into HTML, CSS and JavaScript;
- Flapjax, event-reactive programming language for web applications;
- Reactive.jl, implementation of FRP for Julia;

Reactive programming is offered as a way to easily create user interfaces, animation or modeling systems, time-varying.

For example, in MVC architecture reactive programming can be implemented automatically and reflected in the change of model type to type, and vice versa in the model.

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THE COMMUNICATION SYSTEM WITH MULTIPLE TRANSMITTING AND RECEIVING ANTENNAS (MIMO)

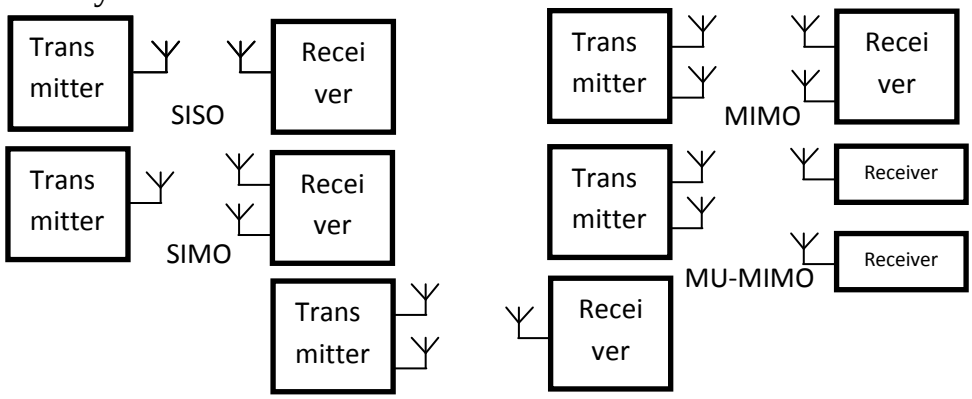
Olha Lysenko

The Institute of Telecommunication Systems, NTUU "Igor Sicorsky Kyiv Polytechnic Institute"

As you know, the traditional communication system is a system with one transmitting and one receiving antenna. The system in modern literature is called the SISO (Single-Input-Single-Output) systems. There are also well-known communication systems with one transmitting antenna and multiple receiving antennas (SIMO – Single-Input-Multiple-Output). In these systems the multiple

receiving antennas are used for implementing the algorithm known as diversity reception of signals in channels with fading. Relatively recently the communication systems with multiple transmitting antennas at one receiving antenna [1] were proposed. These systems are called MISO systems (Multiple-Input-Single-Output). In these systems, as well as systems SIMO, the idea of diversity is realized, but diversity is applied to the transferring side. Thus, in the MISO system algorithm diversity transmission is implemented. The natural generalization of SIMO and MISO is a communication system which uses multiple transmitting antennas and multiple receiving antennas. These systems are known as MIMO (Multiple-Input-Multiple-Output).

In MIMO systems a spatial diversity on the receiving side can be implemented as on the transmission side.Besides, there are many users of MIMO systems, who have a multiple base station with transceiver antennas which interacts with several subscriber stations, each of which may have one or more receiving and transmitting antennas [2]. On pic.1 many possible configurations of antenna systems are schematically shown.



Pic.1.The possible antenna configurations

In MIMO systems, it is obvious, that on the transmitting side and the receiving side the multi-element antennas or antennas arrays have been used. Multi-element antennas can be used to concentrate energy towards a particular subscriber and to generate an appropriate pattern of directivity (Adaptive beamforming directional pattern). In addition, the multi-element antenna can be used to form multiple parallel data streams (spatial multiplexing mode). Common usage of the effects of spatial diversity, spatial multiplexing and beamforming directional pattern [7] allows to:

- increase system stability (reduce the possibility of errors);
- increase data rate in the system;
- increase zone of coverage;
- reduce required power of the transmitter.

These four positive features of MIMO systems, unfortunately, can't be implemented simultaneously. For example, the increasing of the transmission rate of information causes the increasing possibility of error or the increase in radiated power of the transmitter. Thus, the development of a particular communication system must find a compromise.

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IMPROVED TOR PERFORMANCE

Liliya Lyubarska
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Tor is free and open-source software created for anonymous communication. Under the concept of term Tor it is also considered an anonymous network which uses onion routing to encrypt traffic between sender and receiver. This technology of routing is the main in the stack of Tor technologies. This kind of routing is called onion because message has several layers of encrypted data and every router decrypts only one layer as if it clears onion bulb. Tor software is written primarily in the C programming language, C ++ and Python. Use of Tor network helps users to stay anonymous while they visit websites, send emails and even use applications that work on TCP protocol. Tor also helps users to visit blocked sites.

Despite of public opinion, Tor technology is very useful nowadays not only for hackersand whistleblowers, but also for those who want to protect their privacy from different spy projects like PRISM. For instance, Edward Snowden used Tor to send secret data. Tor has many advantages like anonymity and low latency, but it works too slow. One of the reasons why the Tor is slow – a router with low bandwidth in the way of the packet which is the bottleneck. To solve this problem, you must balance the load between the routers. For this purpose, scientists from Tempura project developed a new algorithm for splitting the stream, which distributes client traffic on the various ways in agreement with the detected bandwidth of each route.

Currently, all of the traffic, which the user transmits, tunneled through a single route anytime. Multipath routing is a well-known method to improve load balancing and performance in IP-based networks. It also provides notable result in peer-to-peer protocols such as Bittorrent. But it hasn't been implemented yet in Tor. Hence, scientists decided to apply this technology in Tor networks.

Multipath routing in Tor works as follows. Proxy receives and sends data to the client application (e.g. web browser), then the router at the exit sends and receives data from external servers (e.g. web server). Each endpoint receives data and splits it into parts (packs), adding the sequence number in the packet header. Thereafter, the endpoint portion divides all paths for traffic separation scheme. When the other endpoint receives a portion of the message, it collects and sorts them according to their number before delivering the content to the destination. Simple decomposition method is that the proxy creates multiple paths, and attaches the newly created stream.

So, multipath routing can provide such improvements in Tor network routine:
1. Improved load balancing between routers. When routers are burdened, splitting traffic through alternate half-disjoint paths can reduce the load on these routers.
2. Increased throughput.

3. Realizing higher performance with lower bandwidth routers.

Selecting Tor multipath routing algorithm promotes the choice of routes, which have a higher capacity to provide sufficient capacity for the transport of user traffic and traffic balance through the Tor routers.

Analysis shows that the splitting of traffic can lead to improved value of delay in the client queue and the overall download time.

The following experiments in real Tor networks were carried out, which showed the following results. Tempura project offers improvement in the overall loading time compared to the Tor with one circuit (way). In particular, the average normal load time Tor reaches about six seconds while the Tempura reduces the download Web pages to four seconds.

So, as we can see, multipath routing is very useful technology in Tor which will improve performance and reduce disadvantages.

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NEURAL NETWORKS. USAGE. TYPOLOGY

Irada Maheramova
Faculty of Heat and Power Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

First artificial neural networks have been created as a result of attempts to create a computer model that reproduces activity of brain in a simplified form. Of course, the human brain capabilities are far greater than the capacity of the most powerful artificial neural networks. However, artificial neural networks have a number of inherent properties of biological neural networks, including the human brain.

The main feature of neural networks – learning ability. To solve a problem on a computer with a traditional method it is necessary to know the rules (mathematical formulas), which can be obtained to output (find a solution to the problem) from the input data. With the help of neural networks solution can be found without knowing the rules and having a few examples.

Another important property of neural networks – the ability to find a solution based on distorted and even contradictory data.

What can neuron networks be used for?

Basically, the neural network can compute any function that has a solution; in other words, do everything that traditional computers can do. In practice, for rational use of the neural network, problem has to follow some characteristics:

- absence of algorithm or problem solving, but accumulated a sufficient number of examples;

– the problem is characterized by large amounts of input data;
– the data is incomplete or partly contradictory.

Thus, neural network suites for pattern recognition and tasks of classification, optimization and forecasting. Below is a list of possible industrial applications of neural networks, which are based on either already established commercial products, or on realization and demonstration of prototypes. Banks and insurance companies:

– automatic reading of checks and financial documents;
– authenticity checking of signatures;
– forecasting changes in economic indicators;
– recognition of bar codes.

Oil and chemical industry:

– analysis of geological information;
– identification of equipment faults;
– exploration of mineral deposits according to aerial surveys;
– analysis of impurities compositions;

The typology of neural networks

1. Feedback

A neural network is a collection of a large number of relatively simple elements – neurons, the typology of connections depends on the type of network. Some neurons are associated with the "outside world", some are only with other neurons (hidden neurons). The feed-forward network signal travels in only one direction – network has no loops. The feedback signal from the neural network output neuron to the input of another neuron is at the same or a previous level. In the feedback neural network output signal from the neuron is transmitted to the input of another neuron at the same or a previous level.

2. Feed-forward

The feed-forward neural networks signal travels in only one direction – from inputs to outputs. Line feed-forward neural networks have been established among the first. Feed-forward networks are considered less suitable for the implementation of associative memory than the feedback network, although they can perform the same tasks. It is important to know that it can be proved mathematically that any feedback network has an equivalent feed-forward, which can perform the same functions. In addition, feed-forward network is faster than the feedback, as to find the solution they need to do only one run. Feedback network must repeat the cycle over and over again, as long as the outputs will not cease to change. This typically requires from 3 to 1000 cycles.

3. Hopfield's Network

Hopfield's Network implements associative memory, addressable by content. It is also known as the Hopfield model. It consists of a single layer of neurons which perform the functions of inputs and outputs simultaneously. Every neuron is connected to all the other neurons. All neurons use the function of activation and can provide two output values: -1 (off) and +1 (on). The output of each neuron is dependent on the prior activation. The network operates in cycles. Iterations occur as long as the outputs of the neurons do not stop changing. Hopfield's network is

capable of generalization, producing regular outputs, despite the distorted inputs. Unfortunately the network has a small capacity.

4. Bidirectional associative memory net

It is very close to the Hopfield network. Unlike Hopfield network, an input vector is applied to one set of neurons, and an output is generated on another set of neurons. While in the Hopfield network's output vector is obtained from the outputs of the same neurons whose inputs are fed to the input vector. Thus, BAM network can associate one sample to another.

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THE EFFECT OF SCRUM METHODOLOGY ON CONDUCTING STARTUPS

Roman Makarenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays the popular thing is the stream of creating own ascension, it is called abroad as a startup. Almost everyone, who has some idea attempts to realize it. One, possessing financial resources has more chances to development. The others look for one-track minded people who are ready to work for idea and willing to dedicate themselves to it.

It is not a rare case that interesting, unique idea that could be useful both for developers of this idea and consumers, who could use the result of work, can be limited by the only idea due to many factors. The main negative one is fail work planning of idea. As a rule, startup is people self-organization aiming to achieve the realization of some product or providing services in different spheres for financial benefit and acquiring profit for the following of innovational idea. The key word is "self-organization"; at this stage people face with difficulties. The project is destined to fail without right project structure construction and strict distribution of duties the between project members and their strict accomplishment, no matter to what sphere this project refers.

Companies, working in IT sphere, especially those that are aimed to software development, practice various methodologies of project management. The reason is that software product development is rather complicated process and it requires precise problem statement, the choice of methods of solution, quality checking of the product and integrating it to client. It seems to be easy: it's enough to hire qualified staff and tasks would be solved fast and easily. However, qualified staff hiring is just one element of solving problem. It is necessary to organize their work at every stage of product development. For doing this, there are various organization methods, Scrum is one of them.

Imagine that you have innovative idea for startup development. You have like-

minded people, each of them have skills that can contribute to startup development and building. The first step is to define goals, which are necessary to achieve, so that startup could lead its ideologists and executants to success.

So, the first step is setting goals that need to be reached for product release. As a rule, such ones can be meeting the potential clients' needs, who can use this product. Scrum methodology allows to easy self-organization of group of people, guided by the same goals at all stages of startup development, as from setting idea to its realization and sale.

Scrum has its own artifacts, through which the process of team self-organization is performed. The first major artifact is backlog – a list of requirements to the functionality of the startup product and its arranging according to their importance. As a rule in IT companies, a list of requirements is formed by the customer, but in terms of a startup, things can be different. In this case, the ideologists of a startup need to create a list of these requirements for themselves. It's quite time-consuming, but in result, startup executors and ideologists start to see some picture of actions, which are necessary to accomplish for achieving the goals.

Consequently there is a list of everything that needs to be done, even in the required sequence; it is believed that 20 % of the required work done. Another important artifact of Scrum methodology is Sprint – a time period during which the team must perform a number of requirements from basic "backlog". So a number of requirements is "print backlog" – a set of requirements, which is selected from the main "backlog" in the sequence of startup idea development. Typically "sprint" lasts from one week to one month.

When planning the "sprint" of chosen from main "backlog" requirements a temporal evaluation is implemented and their assignment to team members, competent in solving these tasks. One of the major factors of Scrum is a basic communication between project participants; there is even one more artifact of this methodology – stand-up. This is when participants come together once or several times a day and everyone discusses three main points: what was done; that will be done; what problems occurred in solving certain task. So the team sees the promotion of work during the "sprint" and team members can assist in solving the problem moments of tasks. At the end of each "sprint" team gathers to discuss solved problems and problems that were not resolved during the "sprint", as they are paid most attention and they automatically switch to execution during the next race. Also a demonstration of accomplished tasks is carried out, these are reports, results of surveys of potential customers, demonstration of a work product or piece of software.

The point of Scrum methodology integration in startups is mandatory for startups ideologists identifying their key goals and result of their work, identifying main requirements to a product or service, by which they want to meet the needs of potential clients aiming to get financial benefit and further development; planning of development, organization of team and the project and for effective start of design and implementation of real product and releasing it into operation.

Also, this methodology can be used and as part of the marketing actions and support existing product.

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EVOLUTION OF VIRTUAL REALITY

Dmytro Makoivets

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

***Virtual reality*.** Thesetwo words are quite able to make you excited and also disappointed at the same time.

In 1965 a man called Ivan Sutherland set in motion the wheels of what we will ultimately call virtual reality. He did so with the creation of the ultimate display – the world's first head-mounted display or HMD. This device can place the user in a true virtual world.

Sensorama was created by Morton Heilig. It is basically a box you could stick your head and watch a movie and have all of your senses stimulated. By 1962 he even had a working prototype able to display stereoscopic 3d images in a wide angle view provide body tilting, play stereo sound and also trigger blast of wind and aromas a specific point during each of the five purpose-built short films.

Steady development of early VR tech during the 1960s and 1970s was driven chiefly by the US military's work on vehicle simulators specialist teams at NASA and also researchers at the University of Utah. This progress and tandem with advancements in computer graphics technology really began to gain momentum in the 1980s.

And in 1985 something truly monumental happened. Team at NASA made the Virtual environment workstation. This next step in VR consisted of two LCD TV displays, wide-angle stereoscopic optics and a motorcycle helmet.

Also the term virtual reality was first coined by Lani later a member of the team involved in the creation of the gloves designed for use with the VEW.We can't really talk about the history of virtual reality without mentioning the inspirational Randy Pausch. As well as working for Disney he founded the building virtual world's course in 1998 at Carnegie Mellon University which he talked for ten years inspiring countless students to work in the field and propel a technology forward.

In the 1990s VR video games began to emerge. The earliest publicly available games came in the form of special arcade machines. In 1991-93 the company Virtuality group created the line machines with stereoscopic 3d visuals and mind-blowing 276x370 resolution. But success and early gains VR were rare.

In 1991 Sagan and SEGA VR were even showcased at CES 93. However the console never actually materialized as a retail product despite reportedly having four games developed specifically for it.

The virtual boy was a commercial flop due in part to its price tag $ 179 at launch which is about $ 250 in today's money.

In fact these three problems that killed the virtual boy: cost, lack of software support and customer apathy epitomized the reasons why VR in general failed to live up to its promise in the 1990s. By the end of the decade virtual reality, in the world of games at least, had all but vanished from the scene.

This idea was almost forgotten. Until August 2012 when a Kickstarter project for a little device called oculus rift was launched. It was the beginning of a new era for virtual reality. Many large companies such as Sony, HTC and Samsung have started to develop their own virtual reality devices.

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SPORT RESULTS PREDICTION

Artem Malinovskyi
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

This paper describes the method of basketball statistics analysis. Pipeline of analysis process is provided. Input data and data sources are described.

Nowadays, statistics becomes an important part of basketball match's analysis, but it still difficult to analyze game results, because for prediction not only previous match's results are needed, but also information that could describe state of mental and physical health of players, this type of information could increase quality of predicted results. Figure 1 shows data, which is used as input data in processing module. Weather data are data type that can give information about player's physical state, and social networks data can describe player's mental state. In complex, all this data increases accuracy of machine learning methods of match's results prediction [1].

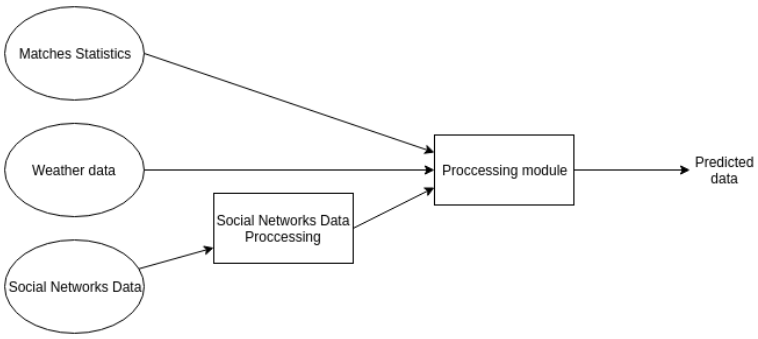

Fig. 1 – Pipeline flow

Weather Data – Data collected from open weather's API on date of the match contains all weather parameters (such as temperature, humidity and etc.), but some data could be useless in such analysis.

Matches Statistic Data – Matches statistics is collected from official site of NBA by some specific parsers.

Social Networks Data – Data is collected from social networks like Facebook, Twitter. In General, it might be also Instagram, but it could be hard to analyze how photos correlate with matches result.

Social Networks Data Processing – module that making semantic analysis of tweets, posts and other type of data from social networks. This module outputs extracted word, which has sense for predictive module.

Building of prediction module consists of two stages:

1) Model training with data provided above – all data except Social Networks Data used "as is", but Social Networks Data clustered in Social Networks Data Processing module before being used.
2) Creating forecasts with trained model on new data – using in the model data that was never used before, and running tests on this data.

After achieving a good percentage of right predictions (on tests number higher then 1000), model is ready for being used in real life.

Basketball matches prediction module and input data are described. In potential, this model can be extended with data such as cardiograms and other data types that are collected directly from player's body. This model can be useful for coaches to improve game of their players.

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REAL TIME PHYSICS SYNCHRONIZATION

Eugene Mamaenko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The multimedia and real-time systems, especially in games, are often need to solve the problem of synchronization of the state. In this way, the problem is the following – to ensure consistency state of the world physics on different clients and provide them with the desired cooperation.

The traditional solution is the use of the server. The server is authoritative, it stores the state, clients are continuously read their status from a subset of the server model. The advantage is that the only authoritative state avoids controversial game situations and resolves them consistent with the viewpoint of the whole game. Disadvantage is that with a large ping from the client to the server, response to the client will be very slow, as it requires a double ping time before the keystroke will lead to the apparent motion of the object on the client.

Therefore, more often used scheme with server and client prediction. The server is still authoritative, but the client simulates a subset of its general state. When the forward button is pressed, the movement of the client begins immediately – on the basis of the results of local modeling. Periodically, the client makes an amendment to its state that it is synchronized with the server benchmark. Amendments are small in

size, and response of client to the user input is much faster. There may be contradictions, for example, a client we have won, on the server – no. Disputes decision may be postponed until the next packet from the server (who won), or a decision on the client can be rolled back (object abruptly pulls back on the server because it is moving forward more slowly than on the client).

The two previous options assume control of the entire server state of the physical world. Objects that do not take a principled participation in the game play, could not be synchronized between clients. It refers to the special effects, the small fluttering objects such as shrapnel. Next, you can use the mechanism of object ownership. Each client has a part (character or any managed object) state of the world and authoritative in determining its status.

Sync state physics only according to the directions and velocities will not succeed. Due to the uncertainties of floating point operations it going out of sync objects very quickly (the same object at different points on different clients).

User input to another mail client to use it on the received input for the simulation is not suitable for the same reason – the rapid accumulation of errors and the variance of objects in two clients. You must use the positional / angular data. After receiving targetState state packet from a remote client, we apply it to the local copy of the object that owns the remote client.

Gaps in the sense of the game can be not only real full communication gap, but rather a long delay, it all depends on the genre. The simplest option – out timeout from the receipt of the last packet of the contender. A reliable way, it is used as a base.

However, in the arcade games there are also important gaps on positions. When the gap in the positions of the object in the local and remote state exceeds a critical size, we consider the connection broken. This method is used with a small correction – the connection is considered to be impaired after a series of continuous critical gaps when the series is longer than the constant. Single gaps occur periodically.

Thus, we can conclude that the best solution would be to emulate two time segments on the client once. The player will be in the future, thanks to the prediction of action, and the rest of the world will be in the past, interpolating theirs state between two time intervals.

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COMPUTER TECHNOLOGIES IN MEDICINE: DICOM STANDART

Olesya Maslyuk

Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays there is an increase in requirement of communication capabilities due to the rapid development of medical computer technologies. Universal computer networking technologies do not have the capabilities to connect various medical equipment. Therefore, its manufacturers have been forced to develop their own communication interfaces. However, we need new communication standards due to the wide variety of medical devices used by different manufacturers. DICOM v3.0 has the technology for uniquely identifying any information and applying compression of images by JPEG standart.

The Digital Imaging and Communications in Medicine (DICOM) is the standard for the communication and management of medical imaging information and related data. This Standard has been developed for diagnostic medical imaging and practiced in different areas such as cardiology, dentistry, ophthalmology and other disciplines.

For better organization of effective work requires more than a simple connection of equipment through cables. Should be found a comprehensive solution for all diagnostic information management, starting with the input of images and ending with archiving. DICOM standard enables integration to solve the problem based on an open architecture. DICOM enables to solve problems with integration based on the open architecture. This standart allows to organize not only forwarding data through the network, but also automatic data processing. It significantly reduces the time of preparation and research, image management, and related information.

DICOM has significantly improved communication between medical devices and lowered the cost and complexity of integrating hardware and software solutions. For editing and viewing files in DICOM format was created software (for DOS) with simple graphical interface that runs in both the real and in the protected (the DPMI) mode. Part of this software is implemented for Windows. Since the creation of simple DICOM-converters, as well as archiving and print servers, gradually moving to full DICOM-solutions. DICOM is a popular around the world and can be used in every locale. It gives mechanisms to manage data that support cultural requirements, such as different writing systems, symbol sets, languages, and person names. It is obvious that today DICOM is well developed standard on which we should be oriented. The research in this direction continues throughout the world.

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WEB-ALERTS IN LOADED PROJECTS

Yevheniy Matiash

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In a modern web designingthere are situations when it is necessary to inform the user about some event: new message, changed course to the stock exchange or order status. There are several ways to solve this class of problems. The most common and the optimal solution it is a subscription event. To get an answer to a query, we need to address to one or more external services.

As external service responds with a delay, and we have thousands of customers, if we make requests directly from a web application, and wait for a response from the service, the system will hang. Therefore, we have to do a pending request. Web application returns to user the generated HTML page without a result, which contains the screen saver with the processing of the request and the result comes later.

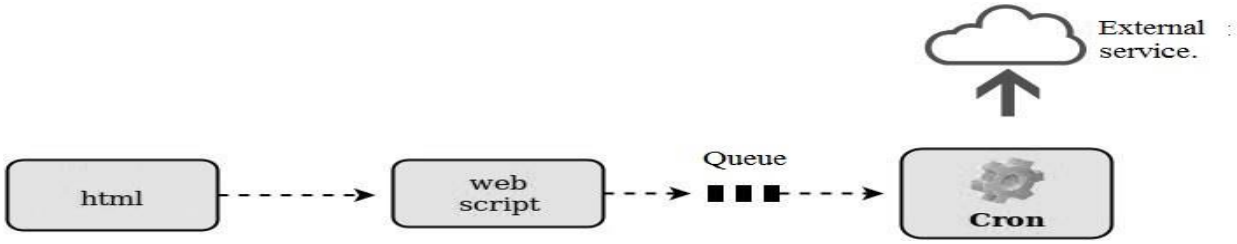

Fig. 1

Before creating the HTML page our web application puts the data in queue. The daemon scans the queue and takes it out of the data. Further, on the basis of these data, it generates the request and sends it to the external service.

Like, everything in this scheme is good, but we need feedback. Here we will help Publisher-Subscriber pattern. Subscriber subscribes to a certain channel, and in the accomplishment of an event, the publisher sends a message to the same channel. In a lot of different solutions a notification mechanism can be used such as: Redis, RabbitMQ, Tarantool, MsMQ, ZMQ, Kafka. The websockets shouldbe used to communicate with web pages and server, because it is the most advanced technology of instant communication web client and server.

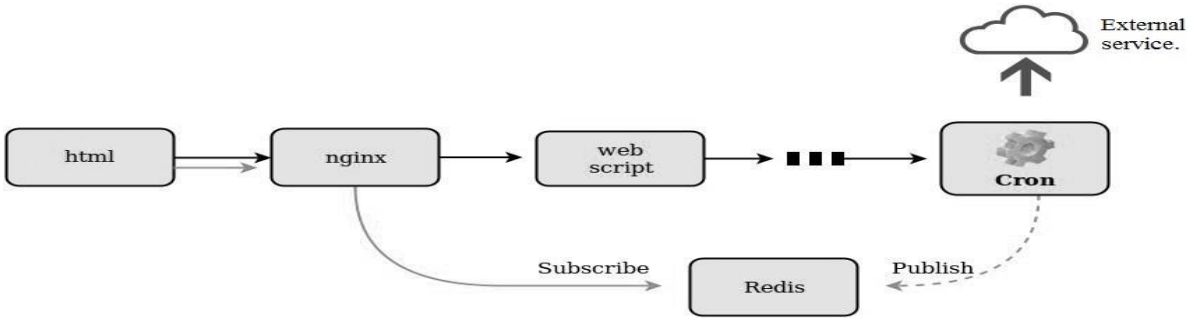

Fig. 2

Consider the server side. If a backend php-fpm is used, with each running web-client, PHP process should run. There is a problem with a large number of requests,

since each request will hang a separate process, which would entail a lack of memory. The Figure 2 shows the result. To solve this problem, you can use nginh connecting with module nginx-lua. In addition to the lua-nginx-module you can connect lua-resty-redis and lua-resty-websocket.

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IMPORTANCE AND NECESSITY OF STREAM CIPHERS EXAMINATION

Aleksandra Matiyko, Vladyslav Dubok, Sergii Valovyi

Institute of Special Communications and Information Security,
NTUU"Igor Sikorsky Kyiv Polytechnic Institute"

Contemporary issues of selection, application and practical implementation of stream encryption algorithms are becoming increasingly important because after all streaming symmetric ciphers have an important role to protect the information for which stability and speed are significant requirements. Effective privacy solving problems in the networks of satellite and cellular communication is only possible by using streaming encryption. Stream ciphers are widely used in network technologies too.

Recently streaming encryption schemes have become widely used in commercial products and are no longer "closed technology" for special use. However, the usage of stream ciphers, as any other cryptographic technologies, require neatness and accuracy. For quite well known disadvantages A5 stream cipher used in standard GSM.

Software-oriented stream ciphers should provide a sufficient level of stability, speed and be compact in the hardware implementation. Shift register is one of the elements used in the construction of hardware codes; therefore, they require constant inquiry and analysis.

In addition, search of resistant synchronous stream cipher is of considerable interest in the European scientific community. This indicates the presence of projects eSTREAM and NESSIE, aimed at finding sustainable stream ciphers. Currently scientists are working to create a national standard in streaming encryption in Ukraine.

Extensive usage of streaming encryption schemes makes the actual problem to their cryptanalysis. Many scientists who assess the stability of the cryptographic algorithm are researching this issue. Cryptographically persistent cipher is that cipher which cannot be decrypted (broken) in real time. To do this, scientists perform some attacks on the study code, study its properties, weaknesses and try to improve it.

All methods of cryptanalysis of stream ciphers are typically divided into three classes:

1. Power method (attack "brute force") is the attack by exhaustive search (brute all possible). The complexity of exhaustive search depends on the number of possible solutions to the problem (the size of the space keys or plaintext space). This type of attack is applicable to all types of streaming encryption. Developers strive to make this type of attack the most effective versus other existing methods of hacking during the development of encryption systems.

2. Statistical method is divided into two subclasses:

– the method of cryptanalysis statistical properties of the encryption gamma, aimed at studying the original sequence cryptosystem; cryptanalyst tries to set the next bit sequence with a probability, which is higher than probability of random selection using different statistical tests;

– the method of cryptanalysis complexity sequence: cryptanalyst tries to find a way to generate a sequence of similar gamma but in more easily implemented way.

Both methods use the principle of linear complexity.

3. Analytical method is the type of attack, which is considered under the assumption that the cryptanalyst knows the description of generator, opened and closed texts. The task of the cryptanalystis to determine the key used (initial filling registers).

Types of analytical attacks applying to synchronous stream ciphers are:

- correlation;
- compromise "time-memory";
- inversion;
- "provides for and defines";
- the key loading and re-initialization;
- XSL-attack.

One of the works that has been studied by us is the work of "Generalized statistical attack on stream ciphers" by A. Oleksiychuk, S. Konyushok and A. Storozhuk. It describes the statistical attack on synchronous stream ciphers (the signs generated by the key gamma do not depend on an open and encrypted text and depend only on the source of the secret encryption key) based on algebraically degenerate approximations of Boolean functions and probabilistic approximation method of searching this function. The complexity (namely efficiency) of this attack was conducted on the example of GRAIN-128 and, furthermore, the ability of usage this cipher was analyzed.

Thus, we can conclude that the contemplation of stream ciphers and cryptographic methods to analyze them are extremely important in today's world because streaming encryption is used everywhere thanks to its speed. Nowadays the stream cipher SNOW 2.0 is being the basis of Ukraine's standard in streaming encryption. We know that this code is cryptographically resistant to attacks based on statistical algebraically degenerated function, but it needs research in relation to other attacks.

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WHAT IS 3D MODELING?

Mikhail Matsegora
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

3D modeling is computer graphics, which combines the methods and tools that are needed to create dimensional objects in three-dimensional space.

Under the methods of 3D modeling is necessary to understand how the formation of the 3D object – the calculation of its performance, the composition of the "skeleton" or bulk form is not detailed; cutting, extrusion and building parts, etc.

Under the tools necessary to understand the professional program for 3D-modeling. First of all – SolidWork, ProEngineering, 3DMAX, as well as some other programs for volume rendering of objects and space.

Volume rendering – is to create a two-dimensional raster image based on built 3D model. At its core, this is the most realistic portrayal of the volume charts.

At this time 3D modeling is used in many fields: advertising and marketing, urban planning, industry, computer games, film, architecture and interior design, and also in the animation.

Development of the 3D model is done in several stages. The initial stage of development – the creation of simulation or model geometry; the second stage – texturing object, i.e. the creation of realistic images; the third stage – billing to light and the observation point; fourth stage – 3D visualization and rendering. The final stage of the development of our 3D model – postproduction.

There are several methods of 3D visualization (rendering): rasterization, ray tracing, path tracing. The founding father of 3D graphics can be called Ivan Sutherland – this talented man in the days of post-graduate work at the University created SketchPad application.

SketchPad – small but revolutionary program in the world of computer technology, which made it possible to produce the first 3D objects to light. It became thus "push", which served as the rapid development of three-dimensional image – thanks to SketchPad we have is 3D, it is.

After defending his thesis, explaining the world to what it was in 3D (then still this abbreviation is not used), in collaboration with Dr. David Evans, Ivan launches to the public its new project - the first department of computer technology in the world, namely, vector and raster graphics.

After that, back in 1969 an alliance with Ivan Ed grew up in their first own company, engaged in the development and mass production of CG (stands for computer graphics – Computer Graphics).

They called it simply – "Evans and Sutherland". World famous 3D graphics manifested itself – in those 70 three-dimensional image technology used only in the

framework of television projects, such as advertising. An example of the first commercial 3D animation – rotating 360° IBM logo at startup of the same name computer was created in the 70s.

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GYROSCOPIC STABILIZER FOR ASTRONAVIGATION SYSTEM

Olena Matsiletska
Faculty of Aerospace Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Gyroscopic stabilizers are used for many tasks. Gyroscopic stabilizers typically used in warehouse management rockets, space ships and space stations, aircraft, naval vessels, submarines, etc. Gyroscopic stabilizers used in video surveillance systems based on unmanned aircraft and balloons. Additional stabilizing gyroscopes used in panoramic heads and other devices for the filming of the motion. The main part of any of the gyroscopic device or system is gyrostabilizer, which largely determines the accuracy and performance of gyroscopic systems.

Astronavigation system designed for in-flight determination of coordinates of position and heading of the aircraft with the help of astronomical measurements. The invention relates to the field of astronavigation systems for determining stabilized elevation and azimuth at astroorientation, because of which determine a correction course indication and position. The technical result of the invention is to minimize the number of sensing elements to provide the desired accuracy determine the correction course indication and the location.

The specific characteristic of the astronavigationsystem of the aircraft is ensuring high precision stabilization of optical device in the angular oscillations of the aircraft, for example, under the influence of flows of air streams etc.

The problem of this work is designing the gyrostabilizer for astronavigation system. The main objective of the system is increasing the accuracy of navigation system, and solution to the problem of error's accumulation of inertial navigation system. As the accuracy of the errors, which accumulating in the system, related to the accuracy of stabilization angle measuring instrument, the stringent requirements imposed on the accuracy to gyrostabilizer. It is also necessary to ensure operation of the device under the influence of vibration with a wide range of frequencies and roll of the aircraft.

This work was deal with functional diagram of the device with gyro stabilization on three axes and using external media navigation system to correct gyroscopes.

The mathematical model was derived platform and azimuth-altitude suspensionteleblock. Was elected sensitive and actuators based on the requirements specification, developed by the contours of the stabilization method desired log-amplitude characteristics. Gyrostabilizer mathematical model used for modeling real-time systems Matlab Simulink and investigated the stabilization error for various external perturbations.

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THE STRUCTURE OF SCALABLE JAVASCRIPT APPLICATIONS

Andrii Mikhatskyi
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

If you are working on a web application, then you spend most of the time on code completion, error correction. Any complex web application is constantly changing. Think what will happen if you need to change your favorite library. To make this process easier, you need to add a wrapper around the library functions – it may be a Core of the application.

In addition to the library wrapper, Core performs other functions: it controls other parts of the system, provides a communication interface and controls all application errors.

The application consists of modules – they are independent parts of application, driven by Core, but they do not have direct relationships with the very core. Heavy JavaScript application is the same complex as the space station.

Modules of web applications consist of HTML + CSS + JavaScript + Resources.

Module Resources – localization, descriptors, and other private data of the module.

Each module has to live separately from the rest of the application. The aim of each module is to perform a single-minded function.

To ensure loose coupling and to limit the freedom of the module it is necessary to enclose it by a special object-medium – sandbox. Each module must be within its sandbox and only communicate only with it. Sandbox acts as a security guard – it knows what module can do and knows with whom it can communicate. Sandbox provides a link with the Core.

The module can call its methods, and methods of the sandbox, use its HTML element. The module must ask for permission before performing any action. Module is forbidden to create globals, to use non-standardglobals and to directly

communicate with other modules. Each module acts as micro-application, which may have its own rules, the rules must not conflict with global rules. Each module may delegate his sandbox its parts, connect the other modules (during project build).

The Core does not matter how the module will manage its parts - it is important to ensure compliance with global rules for each module. To reduce the number of connections within the system, we need strict subordination: only library knows about the browser and the available API; only the Core knows about the library; sandbox only knows about the core; each module knows only its sandbox.

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MACHINE LEARNING

Kostyantin Minkov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Machine learning is a subfield of artificial intelligence. Early artificial intelligence programs could solve only one typical mathematical problem it were made for. The main disadvantage of such technology is that human programmer cannot provide explicit specification in case of big variety of different tasks. Machine learning gives to computers an ability to perform operations relying on experience and examples instead of just applying predefined rules. Nowadays, it's become a useful tool applicable to all tasks that require analyzing huge amount of information and extracting it from large data sets. Affordable data storage, cheaper computation powers and growing volume of data made machine learning quite popular in the modern computer science. Advanced algorithms can provide accurate predictions guiding better decisions and actions without human intervention.

Many applications use machine learning as one of their components. For example, some security systems require face recognition as a way of identification. With the usage of picture or video, the system can classify the face, recognize and identify the person.

Machine learning tasks are generally divided into three main categories: supervised learning – computer analyzes input examples and desired outputs to find general rules that help to map inputs to outputs. Unsupervised learning finds hidden structure in "raw" input data and describes it. This technique is commonly used for discovering patterns in randomly distributed information objects. Lastly, reinforcement learning stands for interaction between software and environment with maximum benefit. Self-driving car system can be a good example of reinforcement learning usage.

During the learning process, computer uses classifiers. The simplest classifier is named as kN-algorithm. It measures the euclidian distance to the nearest labeled point from the data set and predicts it being the same type. Other way to make a

prediction about the object nature is to use a decision tree. Computer can easily determine the identity of the object while answering to binary questions. Neural networks are another promising method of analysis but it won't be discussed here. In recent years, a significant development in this area of technology happened. With support of major companies, the future growth should become even stronger.

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WHAT IS 3D PRINTING?

Dmitriy Misik, Alexandr Volontyr
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

3D Printing is a process of making solid 3D object from a computer file. 3D Printer is peripheral device that use layer method of physical creating digital 3D model. The first 3D Printer was created in late 1980-th.

However, Charles Hull investigated technology early in 1984. He developed SLA technology – stereolithographic. You can print 3D object by their digital model using photopolymerization - a process by which chains of molecules links together.

In 1986 Charles founded company 3D Systems and designed his first commercial 3D printer. It had simple name – "3D Printing Device".

In 1988, 3D Systems developed new 3D printer called SLA-250. It was a great size machine, but many manufactures bought it.

Also in this year, Scott Crump invented new technology – FDM. This technology is the most used nowadays. Even "home" 3D printers use this technology.

Later, in 1989 Scott found new company called Stratasys. Only in 1991, they release new 3D printer from Dimension series with extrudable printhead. In addition, company Stratasys sold their machine build on FDM technology – 3D Modeler.

In 1993 was founded company Solidscape. Now, Solidscape is the leader in 3D manufacturing.

Only in 1995, Massachusetts technology institute brand new term – "3D Print". Later in this year, company called Z Corporation get license from MIT to use 3DP technology.

Z Corporation worked a lot on brand new printer. They release 3D printer build by new technology called Z402 in 1996.

3D print is rapidly growing. Now, everybody can buy 3D printer and use it in home. However, you should know thatunlike 2D printing, 3D printing is hard process so you should be trained person to print 3D objects.

Besides, 3D printing is popular in medicine in prosthetics and creating implants. There are many experiments on the printing of donor organs. In 2015 the USA started production of drugs using 3D printers.

Also 3D printing is used in weapon industry. But in 2013, Philadelphia (the USA) passed the law that ban printing weapons. There is law that denies illegal manufacture, sale, purchase and possession of guns printed on 3D-printer in Great Britain.

Ukrainian startup Kwambio, known as the online platform design of 3D forms, has launched Ukraine's first production 3D printing a full cycle

Earlier this year, Kwambio launched in New York online shop designer goods, manufacture of ceramics and various metals with the use of 3D printing technologies.

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GRUNT, OR GULP: THAT IS THE QUESTION

Oleksandr Mizov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Politechnic Institute"

In the days when sites were small, the need for a separate assembly front-end was not. However, the size and complexity of CSS and JS all increased, and the form in which it is comfortable to develop became very different from the kind in which you want to display it to the user. There were tasks like concatenation (bonding) files, minimize code and even pre-compilation. This resulted in special front-end assembly system, which I will tell you.

Of course, as soon as the need for the assembly became palpable, immediately, tools used for back-end began to emigrate to the front-end. Their main problem and the reason that they are less use for front-end – they are not completely adapted for front-end's specificity, as the project structure, use of technology and the development cycle is very dependent on the objectives of the project and can vary significantly.

Ant, for example, has a verbose syntax and not really able to do the things necessary for the front-end: built-in task quite a bit and expand it very difficult. If we talk about the GNU-make, it is much more versatile, because it operates the shell-command. Also, it has the special syntax, which should be further studied, the need to be familiar with the shell, as well as the tendency to rapidly growth complexity of the Makefile during the assembly of requirements.

Let's review a medium-sized site with a standard structure and try to list the main assembly steps, which it passes. For simplicity, we do not create different JS-files for different pages, but you want to keep in development a few small files to support any kind of modularity. Usually, it looks something like this:

```
/libs/
  jquery.min.js
  underscore.min.js
/js/
  common.js
  carousel.js
  popups.js
/sass/
  main.sass
  color.sass
  …
/css/
  main.css
  media.css
  color.css
/img/
  …
/json/
  …
index.html
...
```

The build system usually does the following tasks:

- concatenate all JS-files into one;
- JS-check the code for validity;
- minimizes the code, make it unclear as necessary;
- SASS-files convert to the CSS-files;
- add vendor (browser) prefixes
- concatenate CSS-files;
- minimizes the CSS;
- gather all files in one deployment directory and connects them in your HTML.

This simple scheme is complicated by additional requirements: performed tests compiled CSS-preprocessor's code, optimized images, compiled templates, etc.

All these problems and more are able to solve modern assembly tools. We consider two of the most popular solutions that run on the platform Node.js. A common advantage is a clear language that every front-end developer knows, the initial focus on the solution of the front-end's problems, and of course Node.js environment in which you may already be developing your application.

Grunt

Grunt – the oldest, most important and most popular build tool. Despite this, he has a couple of significant drawbacks:

At first, Grunt is verbose. In setting a simple assembly system required configuration which consists of hundreds of rows.

Secondly, Grunt was designed as a versatile product, using it you can solve almost any problem related to the project assembly. It's cool, but versatility has its price. Its price is verbosity and speed. In comparison with other systems which build on Node.js base, Grunt slower, and it has a tendency to slow down with the project grows.

Despite all this, Grunt has a huge ecosystem, which consists of hundreds of plugins, thousands of projects, billions of developers.

Summarizing, we can say that Grunt – an excellent choice for small and medium-sized projects, especially if you have not previously set up any assembly systems.

Gulp

Gulp is an actively developing assembly system today. At the heart of its architecture is the use of threads in Node.js, which allows not recorded on a disc temporary files and folders. The main advantages of Gulp – speed and brevity of configuration file. Gulp – a breath of fresh air after a Grunt.

In the Grunt's configuration file you operate plugins individually to customize each of them, in the Gulp's configuration file you need to describe the process (task) that has to go through every file (or set of files) to be able to finish collect.

Of course, Gulp has less number of plug-ins than Grunt, but almost for all common tasks Gulp has plug-ins. If you like this approach to building, speed is important for you, and it is not necessary to perform specific tasks, the Gulp can be an excellent choice. Currently, Gulp remains the most serious rival to Grunt.

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WHAT ARE THE DIFFERENCES BETWEEN "BIG DATA" AND "ORDINARY" DATA?

Maksym Mrynskyi
Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Big data – a fashionable topic today, appearing on nearly all professional conferences devoted to data analysis, predictive analytics, Data Mining, CRM. The term is used in areas where actual work with large volumes of data, which is constantly there is an increase in data rate organizational process: the economy, banking, manufacturing, marketing, telecommunications, web analytics, medicine and others.

What is Big Data in general? Everyone knows that it is processing of huge amounts of data. But, for example, work with Oracle-base 20 GB or 4 petabytes –it's not Big Data; it is just highload-DB.

So what are the key differences between Big Data and *ordinary* highload-systems? The key difference is an opportunity to build flexible queries. The relational database, due to its architecture, is designed for short fast queries, reaching the same type of flow.

If you suddenly decide to go beyond the limits of such requests and to collect new complex, the database will have to rewrite – or it dies under load.If we go a little deeper into the architecture, we can see that traditional databases store information very precipitation. For example, we have the local phone company, phone number

may be on the same server on the same table, and the balance of itis in the other table. Performance requires maximum data partition. As soon as we begin to make complex join, performance drops dramatically.

And how it can be solved? We need different database architecture. If you need flexible queries, the easiest way is to store unstructured data – because they have to somehow build a new optimal structure for each new request. The main aim of *ordinary* databases is maximize performance within the limited computing resources.It turns out that one of the goals of Big Data – is the ability to get away from the long project cycles? And by the mass of bugs from traditional databases. Java-methodology is well-known, but it began to apply analytics rather recently. In solving some problems of traditional analytical methods, it is impossible to say in advance that will not work. Sometimes several months required for the analysis of some occurred unpleasant situation with the use of a relational database. Big Data approach quite different, since the data is collected in real-time is stored without processing, and then processed as required based on the current problems which can be constantly changing.

Popularity of the Big Data leads to the fact that often these technologies are perceived as a universal "silver bullet" to solve any problems. But in fact, it is just another tool, which has its pros and cons.

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HOLOGRAMS IN OUR LIFE

Oleksandr Myagkiy, Dmitry Efimov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Every year there is increasing interest in the holographic technology progress that is the subject of this article. Irrepressible interest in this area raises a lot of rumors and speculations, but the truth of scientific advance is still possible to find out.

In general, scientific community considers the hologram as a picture of the item containing entire optical data about the object of interest. More technically the picture represents Amplitude and Phase data of the light scattered from the item. Within researches in this field many different types of holograms were formed, the main ones are: Reflection Hologram, Transmission Hologram, Hybrid Hologram.

Significant success in holographic technology development was achieved in Japan (UTokyo), the US (UMich) and Europe (ESA). Each small research team or a huge corporation can contribute tothe technology development. Different countries are engaged in the development of new solutions and it doesn't happen in a closed circle, but with active accumulated experience exchange.

For the last 54 years the quality of modern hologram technology is incredibly

improved. The practical application value of today's holograms could hardly be overestimated: the doctors practice on real objects holographic models, communication with the holographic model of the interlocutor, driving comprehension by trials in a pseudo environment, a virtual teacher, advertising, etc. For instance, in the teleportation technology hologram has been recently presented by Microsoft. With this technology a three-dimensional image of the person in real time can be obtained, and can be reproduced in another place so to say by embedding it in a new environment. Thank to ultra-fast lasers it is possible to touch and feel hologram. If we continue to develop these technologies and then combine them we may ultimately obtain a new incredible result.

Despite significant advances in the area of hologram development, a set of challenges remain to be unsolved (e.g., sound localization in the holographic projection region, large complex high definition objects, high energy consumption, the enormous costs of components for the study, the very high cost of production etc). Looking back and observing the success of scientific breakthroughs we can confidently say that now it is difficultto imagine possible limits of holographic technologies.

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OPTIMIZATION OF MEMORY ACCESS

Iryna Mykytyn

Faculty of Aerospace Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The present paper examines the idea of optimization memory stackspace of superscalar processor with the OoO (out-of-order) and front-end of stack machine. The question of redundant memory accesses has been thoroughly researched over the last few years.

Superscalar processor is a CPU (central processing unit) that simultaneously performs more than one scalar team. This is achieved by the inclusion of the Central Bank several independent functional units, each is responsible for a class of transactions and may be present in the processor in multiple copies. There is a problem when the code-generator of stack machine wants to get the value of variable "a", it asks user to "push a". Stack process or prevents referring to the already calculated expressions or pieces.

For processors with registers compiler introduces temporal variables with placement of registers. This mechanism is effective forexternal architecture without register.

First, you need to enter the machine bookmarks which run the compiler identifying their number for each function. At the start of the function the required number of registers in bookmarks are allocated, these registers can not be released until the end of the function. Then Bookmarks fall into the register window and mechanism FILL / SPILL acts on them. If the compiler considers valuable calculated

value, then sets the tab, for example, the instruction "bmk 1", which means: the value on top of the stack is now considered to be bookmarked with the number 1. It does not matter whether there is value in the copy bookmarks in the register N1. When compiler needs further value to this bookmark, it can use it like this: "add_bmk 1", it means that the value of the stack will be summarized with the value Bookmarks 1 and replaced with this value. In terms of backend processor MOS (metal oxide semiconductor) summing two registers in the third will be formed.

There is a need for a second line of arithmetic and logical guidelines (add-> add bmk, mul-> mull_bmk, cmp-> cmp_bmk) or or more general option is any argument can be bookmarked.

As a result, the compiler has two relatively new resources for optimization.

The first is the identification and location of tabs, which could be quite large, it is not limited to the number of accessible registers in the absence thereof. In general, this is the equivalent of local variables placed in the "fast" stack.

The second is the equivalent expressions converted to a form of the most evident internal parallelism. The compiler tries to reduce the height of the trees expressions due to the growth in breadth.

This study shows why we need a new architecture. From the outcome of our investigation it is possible to conclude that we expected to simplify the hardware, outwardly invisible scalability register number and the number of functional devices, as well as the potential to simplify compilers. The proposed method can be readily used in practice.

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DDOS ATTACK COUNTERMEASURES

Alyona Nabok
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

There are many varieties of dangers in the Internet. Malware, that steel or erase your personal information, winlocks, that block your browser or even an entire PC, blame for watching pornography or law violation and ask for money to disable itself… However, large corporations that widely use servers and networks in work often meet much more irresistible aggression form. It calls Disturbed Denial of Service attack or just DDoS.

There are a lot of methods and types of such attacks, but all of them work on one classic scheme. A distributed denial-of-service (DDoS) attack occurs when

multiple systems flood the bandwidth or resources of a targeted system. Such an attack is often the result of multiple compromised systems (for example, a botnet) flooding the targeted system with traffic.

A botnet is a network of zombie computers programmed to receive commands without the owners' knowledge. When a server is overloaded with connections, new connections can no longer be accepted. That paralyze the work of your facility and cause large amount of money loss.

Theoretically, DDoS attack almost irresistible. Some of it's varieties can't be deflected anyway, except server disconnection. That means attackers victory, because they reach their objective. Your network itself sets the first countermeasure. The larger your traffic amount you can pass by a period of time – the harder your server will be to fall. The strength of DDoS is dependent of how large is attackers' botnet. The greatest attacks brought down a huge number of bots up to 100 000 machines.

Like in 2013 at Ukraine, when government decided to block ex.ua file sharer. The second wall of your defense is special software. It allows to block some addresses in the net, that send a data flood. Therefore, they reduce a pressure on server. However, it works against a few easiest methods of intrusion. In addition, the last and the best countermeasure is… psychological armor. What does that mean?

Most of DDoS attacks are acted because some group of people extremely hates another group of people, or wants to reach some of their own targets. Such groups can collect a huge botnet using such service as LOIC (Low-orbital Ion Cannon). They are mainly provoked by actions and publications of victims.

The second kind of people usually can work for governor structures or yours concurrent. That requires a great conspiracy from your side, because attackers often need just a cause to launch a violent assault of flood and information to your service. Partially, DDoS attacks are unavoidable, but you can minimize risk of been attacked by following this recommendations.

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COMPUTER REALIZATION OF THE MODIFYING CORSI TEST

Gennadiy Naumov
Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Over the past decade due to the extremely rapid development of technologies and their dissemination to all areas of human activity, the amount of information that

has begun surrounding people, is constantly rising. Continuous access to the Internet not only available to desktop computers but also to cell phones, has led to the fact that people, almost always have access to the vast amount of information, which for a brain is difficult to accept and process, and constant multifunctional tasks and lack of concentration lead to deterioration of cognitive functions of the brain.

Massive amounts and accessibility to a variety of gadgets, reduced the need for memorizing routine information, which caused the reduction of memory work. Constant stress is also one of the reasons of deterioration of the general condition as a whole, but also memory in particular. So, establishing a computerized system for testing cognitive function of people is very important.

Memory is one of the most important components of cognitive functions and mental abilities of humans. [1] Therefore, diagnosing during the early stages of different deviations of this function, can help to prevent the development of possible diseases of the brain and help in a timely provision of proper care or advice.

Corso test was developed in the early 70s of the twentieth century [1]. The test consisted of a field on which nine wooden blocks were placed. The experimenter pointed to a certain sequence of blocks, that the test participant had to recreate exactly. Typically the experiment began with two blocks and was gradually increased to nine [2] After that the number of memorized sequences and the longest sequence number of elements was counted.

The most famous modification of this test is known as "matrix of memory". It consists of a field, divided by a certain number of cells that open up for a short period time. Participant must remember these cells and recreate them in the proper order. Gradually the number of cells that need to be remembered is increased, thereby complicating the task. At the end of the test the amount of correct cells is counted. The usefulness of this test is in the conducting speed and the immediate acquiring of results. Based on the received results a conclusion can be made about the state of the short-term and working memory.

Computer implementation of this test, will give the ability easy of an easy conduction and a full analysis of the results. And the ability to store the received data in the database will allow to compare the received results with other participants of the test, and to monitor the dynamics of personal testing. A desktop and also web versions of the test are available. But the most convenient for a user is the mobile application format. This interpretation of the test will give the opportunity to take the test at any time and place.

Depending on how the user completed the test, we can make a conclusion about his memory condition. If the results are very low, it can perhaps be a result of a temporary body condition, such as stress or fatigue. Or it could be one of the signs of more serious diseases, such as sclerosis of cerebral vessels [3].

However multiple testing can work as a simulator, because memory has the ability to develop. So computer realization of Corso test modification, or "matrix of memory" can be used as one of the components of the early diagnosis of brain work and memory disorders, and the revealing problems of cognitive functions of the brain.

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PSYCHOLOGICAL IDENTIFICATION OF PERSON BY MODERN IT-TECHNOLOGIES

Kateryna Nehoda, Mykola Kuksa

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The development of information technology significantly affects the principle of the experts of many fields, including psychologists, contributing to the improvement of diagnostic tools, developing new methods of psychological identification of a person by means of modern information technology.

The main areas of application of modern information technologies are in psychology, computer diagnostics, modeling human psychological processes, statistical analysis of test results, formation of databases and processing of raw data. The unite of all the above-mentioned specialist's activitiesin a single system is topical at the moment. Also, the psychological benefits of identifying people by automated systems are: reducing the possibility of making mistakes and saving specialist's time in the processing of raw data. The introduction of computers in psychological identification of the people mainly occurs through the creation of automated versions of certain techniques, designed for traditional use.

Computer system "Psyhomat" includes many different methods and models of psychological assessment of children. The system is calculated for use in educational institutions for children and children's rehabilitation centers. Mainly tasks are expressed in test form or in the form of forming experiments. The system conducts very thorough psychological examinations of children. Also the system has got a scanning subsystem which tests forms to automate processing.

Systems that are simple test questionnaire, where from the suggested options a person should select the one that is most associated in a man with himself are also popular. For example, in Jung's test for the type of personality a person must answer the questions, choosing only one response, in Luscher's colour test – to choose one of the colours, which person likes at the moment. The advantage of these tests are available online version.

Most existing systems of psychological diagnosis are represented as tests that are convenient for automated processing of results. But more interesting as a tool of psychological identification for both children and adults are drawing.

Recently formed alternative approaches in psychological identification of a person are application of pattern recognition theory. There are a lot of mathematical models of pattern recognition that interpret geometric position and characteristics of objects depicted in the figure.

Modern information technologies provide the ability to use mathematical

machine analysis of such data. Therefore, the application of the theory of pattern recognition is immediate prospect of improvement of psychological identification of the human condition in his drawings.

The system recognizes the images in pictures can considerably facilitate the work of psychologists in the processing and interpretation of drawings with the appropriate psychological methods of analysis of images depicted on drawings.

There are four general approaches to pattern recognition, such as template matching, statistical methods, structural methods and neural networks. Neural networks are built on the principle of the human brain, that helps precisely to recognize images in the pictures and describe them.

The neural network is a computational framework that consists of artificial neurons – nerve cells abstract rights. These structures are widely used in pattern recognition, data processing tasks and functions approximation. The main advantages of neural networks are the ability to learn automatically based on sampling data.

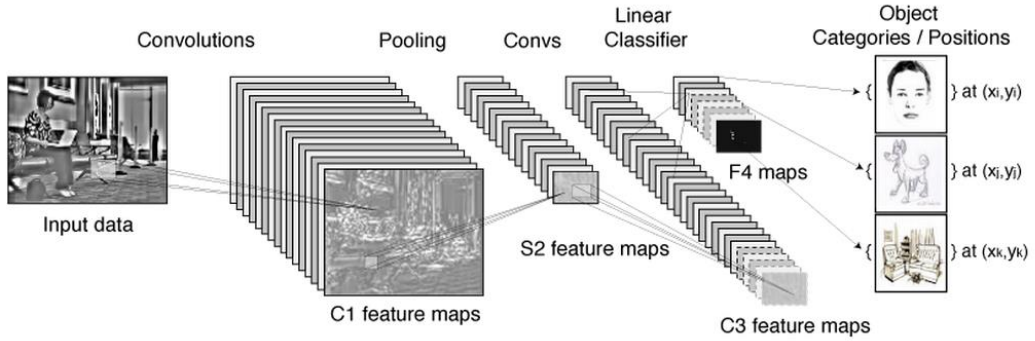

Fig.1 The structure of the system of pattern recognition

Modern pattern recognition systems are built on the basis of neural networks. The advantage of these systems is partially open source and availability of demo versions of software which can test and choose a product that will give the best results in pattern recognition in the figures and improved algorithm program.

The example of image recognition system can be NeuralTalk system, based on the neural networks that generate the most detailed text description of objects depicted in the figure to reduce the possibility of errors in identifying the psychological state of person in his picture.

So, for the psychological identification of human figures it should be used neural networks, as they can simulate the processes of thinking and analysis of the human brain. The specialist for the figure pattern recognition can choose the existing system for further analysis by psychological methods.

The modern information technology increases the efficiency of professional psychology, because it is possible to test a large group of people, and also helps reduce the time to process the data and improve the accuracy of the results of psychological identification of a person, which virtually eliminates human factor.

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THE PHONE, WHICH CAN SENSE EVERYTHING AROUND YOU

Mykola Nepokrytyi
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Your smartphone soon may become smart enough to see the space around you. The size of the room, the location of windows and doors, the presence of other people – it's just a short list of thing that will be able to sense the cellphone, which is going to produce Lenovo in collaboration with Google. The project, which has been under development for three years and will soon go on sale, called Tango.

Chinese company Lenovo is developing a phone that will see our world in all its three dimensions. The main aim of project is to give to device human understanding category of space and movement. Tango technology detects objects in their entirety. His work with the "extended reality" is based on a quite crude technology, however even they are recognized as revolutionary. The work of smartphone is based on a 3D-recognition technology, which similar to the Microsoft Kinect, it can automatically simulate moving objects in three-dimensional form. The first samples of technical developments were attached to the arms of volunteers for the break-in hardware and software. For operation of the device is that it requires as many as three cameras for various purposes: simple four megapixels camera, a motion sensor and an optional depth sensor.

To the development were connected universities and laboratories in nine countries. In addition, after the release of a new device expected developing of more than a hundred mobile applications for tracking space. The new technology will instantly demand in almost all industries, which related to 3D-modeling of the space, for example, in interior design. In addition to home use, the program should be useful for larger industries such as the aerospace industry.

WHAT'S NEW IN NODE.JS v6

Anton Netudykhata
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Node.jshas become a popular among the programmers. A number of reasons can be provided in order to explain why this platform is so much popular these days.

Node.js is JavaScript runtime environment, which is used for web apps, internet of things, apps for smartphones, big enterprise application, startups. Recently, Node.js has relesed to a new 6 version. In this version increased productivity and made security improvements and also implemented full compliance with the new JavaScript standard specifications.

Updated version is four times faster than previous. New version based on Google's V8 engine.

New improvements include support of ES6, which is the latest standart of JavaScript. Now 98 % of ECMAScript 2015, which is also known as ES6, features is implemented. New features comprise:

- default function parameters;
- rest parameters, which allows developers to represent an indefinite number of arguments as an array;
- spread operator;
- destructuring;
- proxy;
- symbol.

Now modules loadsfour times faster over against to the actuallong-term supportversion. It helps to reducethe initial stage of the applications. Created new API for Buffer object to decrease emergenceof bugs. Old constructor of Buffer object got status "deprecated". By default buffer filled by zeros, but if it nit required developers can use Buffer.allocUnsafemethod. It lets developers use outdated modules that haven't been updated to use API.

Considering the facts and points, I have mentioned above, it should be said that new version of Node.jsmade this platformmore powerful technology that is made up of innovative and worldwide common components. Therefore, it is ought to receive a wide admiration and ultimately succeed.

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USER VERIFICATION SYSTEM BASED ON PHYSIOLOGICAL PARAMETERS

Oleksandr Ocheretianyi
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Since the beginning of time human population needed security in sending any type of messages. To solve this problem humanity invented encryption. It is a method for coding information which suggests inaccessibility encrypted text for whose people who don't have decryption key. Despite the process of developing encryption, art of hacking codes was developing as well. During Second World War for encrypting German decryption code British mathematicians developed first prototype of computing machine. Thereby problem of encryption was the cause of inventing computers as a tool.

All types of encryption are divided into three types: encryption using knowledge, key word or password. Second type, is encryption which suggests having

a key, tool for decryption like normal key, USB key or magnetic card. Third type is biometric, this method assumes check of fingerprint or retina. At the present time gains popularity usage of different types at the same time, for increasing security level of information.

The world of computer security is not holding, in the middle of 2015 year Amazon presented new type of authorization for smartphone users. Instead of usual password company proposes authorization via recognition of picture of user's ear shell. While user will bring his device to the ear telephone will scan photo and check it with previously made. This way you would win couple seconds skipping unlock before answering phone. Every person is a unique creature, therefore this type of encryption is one of the most secure. However it has some disadvantages like injury of part of body which is used for authorization or usage of waxworks or dead limbs.

Still development of usage of biometric types for authorization is not the only one, one of the problems in bank card security is limited number of symbols used for password and lack of interests of users to invent strong passwords. As a substitution to original way of bank authorization developers from Intelligence Environment invented new mean of authorization, it is using emoticons instead of numbers. User is able to choose password with 44 types of emoticons which are available in different operation systems. As well developers illuminated from the list emoticons which have a lot of similarities. Research was based on discovery of first thesis of substitution numbers in bank passwords. Scientists analysed behaviour of millennials in social networks and messengers, and came to the conclusion that 64% of representatives used emoticons in mailing. This research was a first step in developing such revolutionary type of authorization. Obvious advantage of this method is that scientists proved that human's brain better remembers images than any other information. Other advantage is that number of combination for passwords increases in 480 times. However this mechanism has its own disadvantages, researches show that participants used four of first emoticons as a password. In this case security is not increasing, but as a solution of this problem developers plan to place emoticons in random order in each interaction user with system.

Main problem of all authorization systems is ability to spy, to still and to substitute secret password. Though today we have an ability to get information that nobody can spy. One of the easiest example is getting unconscious movements of user's hand. Firstly at the time of check user will not know that he is checked. Secondly, algorithm works that way that on copying somebody's handwriting system will throw error, because human cannot repeat hand movement without differences. Thirdly checking of unconscious movements gives opportunity for easy and effective diagnosis diseases, which appear this way. Using this type of authorisation human will not worry about forgotten password, all what he needs is to be yourself.

Mechanism of authorisation can have various means of realization, but one of the easiest is to build client-server application. Client part will get data about user's handwriting like: speed of movements, quantity of space taken for picture etc. Other function of client side will be sending encrypted data to server. On the other side server part will check received data with information stored already and send back to client result of check.

Described system has several drawbacks, which are based on emotional condition. It is a thesis that suggests that during powerful emotional excitement user will behave untypically, and that will produce to unavailability of authorization. Another idea states that after long brake in using system, user will not be available to get through check because system will think what somebody tries to hack an account.

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FLEXIBLE DISPLAYS IN OUR LIFE

Kseniia Olienieva, Tetiana Melnychuk
Faculty of Heat and Power Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

In recent years, in the World Wide Web, there is a host of information about flexible displays. The information is constantly kept at the level of rumors, but it will be true in the nearest future. Now the mass production of flexible displays has finally been started. Let's look at flexible displays. What it is and how it works.

Flexible display is a display that can change its own shape. Unlike the most common traditional flat displays they are being currently used in most electronic devices. It is worth noting that in recent years there is an interest of numerous consumer electronics manufacturers to apply this technology in their own e-books, smart phones and other consumer electronics.

How it works. The biggest problem in the production of flexible displays is glass. Glass is known not to be bent. It is a thick, heavy and easily broken material. Flexible displays also rely primarily on existing display technology, known as OLED (organic light emitting diodes) or AMOLED (active matrix of light emitting diodes). Conventional AMOLED displays use organic compounds which produce their own light source, when current passes through them. Unlike LCD (Liquid Crystal Display), displays created by this technology do not require backlighting. In a majority of flexible displays, glass is replaced by the layers of plastic film, which allows to bend them without breaking.

What are the advantages of flexible displays?

2013 – the year of the highest display resolution. 5-inch panel with a resolution of FullHD was produced by LCD and AMOLED technologies. The pixel density was so high as they can be seen only under the microscope. Can we have even better displays than it is now? Do we need such flexible displays? Opinions differ. But there are several reasons to have such. It turns out that not using glass has a lot of advantages. They are:

– subtlety. There is no need for cumbersome glass, flexible displays are much thinner, in fact, they are the finest displays the humanity has ever seen;

– weight. Flexible displays are much lighter than the rest of them as they don't use glass;

– strength. The glass is easily destroyed but flexible display isn't.

What are the disadvantages of flexible displays?

While the benefits of flexible displays (strength, lightness and thinness) are obvious, they have disadvantages, like everything on the Earth. With four or more layers of protective materials, display wears out quickly. One advantage of using glass is to encapsulate the thin film transistor and protect the scheme from moisture and anything else that can penetrate into it. Plastic, of course, doesn't protect from moisture so well as glass, especially if the defects begin to appear after folding and bending.

Over the past twenty years engineers has been working on the flexible displays technology. Investigators are attempting to combine a polymer and a metal foil with a thin film transistor (TFT). The aim is to produce a thin, flexible and coherent protective panel. Flexible displays offer many advantages with respect to the display technologies that are currently in use. Such serious factors as the weight and thickness reducing and improvement of strength are the positive aspects of flexible displays. The potential application of these technologies is so diverse that many companies are actively investing in research to achieve the creation of the ideal product.

Imagine any product that can use a flexible display. Smartphones, players, computers and e-books can benefit from flexible displays. Imagine what a bursting will be when flexible displays come to our life. LCD flexible display having an ultra slim design can be rolled into a tube and taken with you wherever you go. Reusable electronic "paper" that can show the latest news. Electronic wallpaper can portray a picture. Opportunities for further use of flexible displays are endless.

Some investigators have focused on the technology of the organic liquid. For example, organic light emitting diodes (OLED) are self-luminous and do not require backlighting, diffusers or polarizers to work. It also reduces the size and weight of the display, provides a wide viewing angle and low power consumption. OLED displays are not as bright as some other displays, but research is going on. As OLED displays are a new technology, their price will be high, but mass production has already begun. So in the near future the cost will decline.

Samsung has officially launched the line of flexible displays in 2012. The line has received the name "Samsung YOUM". Alternatively the display is called FAMOLED (flexible active matrix organic light emitting diodes). Since Samsung is the world's largest OLED-displays company, it was expected to have a significant impact with respect to flexible displays.

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LINKED DATA TEMPLATES

Marianna Onoprienko

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

RDF data model stores a lot of information in Linked Data. The main point is to give the right definition of Linked Data Templates: a generic method for software agents to publish and consume read-write Linked Data. Templates are created to rearrange the development process in a declarative way as well as make thing easier about a distributed web.

Application resource properties are well explained by Linked Data Templates. While in use process can send an issue to resource URIs and change the resource state. RDF is a source for representations that will be created, stored or mapped from some other model. But the generation of representations depends on the type of application that is used.

It is possible to create application structure using RDF classes by creating a connection between spaces of URI and RDF respectively. To satisfy all the requirements it is common to use RDF-based specification to create LDT classes. The main difference between LDT and other types of Linked Data is the strict specification called ontology.

The Linked Data API is read-only API was implemented to help in creation of RESTful APIs using RDF. Hydra Core Vocabulary is another way to create hypermedia-driven APIs. It is based on combination of REST and Linked Data principles and using JSoN-LD. As a result all access methods do not provide us random-access properties. Both of them use simplified RDF vocabularies, and do not enable reasoning like Semantic Web vision does. Even after deep researches ontology-driven applications are more about UI and not representations.

Annotation inheritance is one of the most important features provided in LDT, allowing us to reuse code efficiently and create new chunks of code during runtime. It mimics object-oriented multiple inheritance: a class inherits annotation properties from its superclasses via the rdfs: subClassof relation, unless it defines one or more properties of its own which override the inherited ones. SPIN takes a similar object-oriented world-view and uses subclass-based inheritance.

As a conclusion we explained how RDF and JSoN-LD can be helpful in creating Linked Data applications. Linked Data Templates is an new sort of cross-platform tool. Using it it is possible to create programs that will run on different kinds of processors, operating systems and can be changed dynamically so the client-based application won't crush. Experience with AtomGraph software has shown that such design is also very scalable, as the implementation is stateless and functional. Using these features it is possible achieve economical advantage in no time. Using SPARQL, Linked Data Templates define a protocol for distributed web of data as uniform RDF CRUD interactions. The main reason of using SPARQL with Linked Data Templates is creation of protocol that will unify RDF CRUD intercommunication. LDT has already implemented feateres from Semantic Web Vision, and it is just a matter of time before it was fully implemented.

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HOME IoT STANDARDS

Lidiia Orkusha, Yevhen Ivanov

Faculty of Radio Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Of course, life will be easier if the house is connected to the Internet of things system: "smart" lighting and sound system, or heating interdepended with opening the gates in the garage that turns on automatically when owners arrive. To implement all this and more using different IoT standards.

AllJoyn. The software that became a basis for this standard was devised by Qualcomm. It is an open sourced framework. AllJoyn is administrated via AllSeen Alliance. Panasonic, Sony, Microsoft Corporation and Cisco Systems are the members of this alliance. They have just started collaboration and certification of their products. Up to date there are only 4 certified products. Other are designed.

OIC (Open Interconnect Consortium). It is an open sourced framework and because of this it is called IoTivity. Even if you have another technology, you can use OIC after installing a plugin. Samsung, Dell, Cisco and Intel use this standard.

HomeKit. Development of Apple. This framework enables you to control household appliances using iPhone, by Bluetooth LE or Wi-Fi. May join Apple TV to manage the house beyond it. You can connect to this system from another platform using the Insteon Smart Hub Pro. The possibility of using this system on other products is warranted by Apple.

Brillo and Weave. These 2 frameworks are a reacting from Google on HomeKit – Apple's standard. Brillo is power efficient Android based standard. Weave is similar to Open Interconnect Consortium and AllJoyn. Because of this different devices can communicate with each other. It is working with other operating systems, not just with Brillo. At least 3 network protocols can be used: Bluetooth LE, Thread and Wi-Fi.

ZigBee. IEEE 802.15.4 standard is the base of this mash network. It is currently used at home in devices that don't need high power. Built in many devices because is has worked for a time. ZigBee standards are used in many types of home appliances as well as industrial devices. Were recently integrated into ZigBee 3.0. Nowadays ZigBee and Z-Wave are leaders in the market that used a full stack. It allows devices works together using hubs. ZigBee Alliance warrants possibility of building bridges between their standard and others. Integrating with Thread is also available, where Thread is a backbone net.

Z-Wave. It is a licensed technology of Sigma Designs – chip developer. It is used in many products. Full stack is also used. Z-Wave Alliance makes it possible to

interact with devices that use other platform. This mash technology has low power consumption and is used in many home appliances.

Wi-Fi. This wireless system uses almost everywhere. It is the basis of the most home networks. But it is not suited for connection with devices that is powered by batteries, because they don't meet their power and size requirements.

Bluetooth. It is a well known network for private usage. IoT is implemented by using the Bluetooth LE (or Bluetooth Smart). It should expand the application field of the network in the coming years.

6LoWPAN. This is mash network that is only used in the Ipv6 standard and is a new version of the standard IEEE 802.15.4.

Thread. Devised in 2014. The base of this standard is 6LoWPAN. It has additional security features, device, routing and awakening configurations.

ULE (Ultra Low Energy). The base of this low power standard is DECT – Digital Enhanced Cordless Telecommunication.

However, it is too early to say which of the standards will be the connecting element that is able to combine lots of gadgets and sensors into a single integrated system that will work in your home.

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WEB DEVELOPMENT PROGRAMMING LANGUAGES

Bogdan Paliy

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Every person who begins his or her journey in creating web resource faces with a great variety of programming languages. There are lots of programming languageswith different tasks and abilities. Each of them is characterized by a unique set of operators and special syntax.

Although the software industry is changing rapidly, programming languagepopularity seems to be an exception to all of this. If we compare the top 10 of thecurrent TIOBE index with the index of 10 years ago, it contains exactly the sameprogramming languages. However, these languages can shuffle in ranking [1].

According to TIOBE ranking, we select the following programminglanguagesfor comparison: Java, Ruby, and Python. Java – is a most popularprogramming language today. Nevertheless, programming languages, likeRuby andPython, quickly gain popularity every day.

Java is an object-oriented programming language. In the officialimplementation of Java programs are compiled into bytecode that is interpreted bythe virtual machine for a particular platform.

Advantages:

– flexible security system, in which program is completely controlled by thevirtual machine;

- a large number of libraries and examples;
- binary compatibility of programs;
- portability of bytecode.

Disadvantages:

- more resources consumption (comparing with alternativelanguages).

Ruby is a dynamic imperative object-oriented programming language. It is characterized by productive typing and automatic memory management.

Advantages:

- works on many platforms;
- can be embedded in HTML markup.

Disadvantages:

- insufficiency of information resources;
- less productive comparing with other languages;
- relatively developed and advances slowly.

Python – multi-paradigm programming language: it allows you to combineprocedural approach of writing code with object-oriented and functional. Python is widely used as language for scripts with various purposes.

Advantages:

- features of syntax, and, as a result, well-readable code;
- provides tools for rapid prototyping and dynamic semantics;
- mechanisms of modularity are easy to use;

Disadvantages:

- the lack of static typing;
- primary constraints for databases;
- less performance in comparison with basic Java virtual machines.

Therefore, Java programming language has more advantages and lessdisadvantages, than other programming languages.The program written in Java runson any platform without any changes in source code and recompiling. One ofthe significant advantages is the built-in language tools for creating multithreadedapplications. Java provides organization of multithreaded mode and cansimultaneously perform multiple tasks. Also it is widely uses in creating mobileapplications for the Android operating system. So, the use of Java programminglanguage is actual nowadays.

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PYTHON

Nicol Pastrello

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today it is important to know programming for everyone. What is the fastest and easiest way to start write programs for yourself? Of course, it's Python. This

language is really easy to learn, and to use it from the first hour you opened your first book on programming language. You may not just start programming like in an introductory book, you may start to feel language-specific features. And if you are even an experienced programmer with a very strong accent carried from languages learned before, you may start to think as a Pythonian! Why is Python so famous? Why is it so easy to start programming today?

The Python language has a lot of killer applications like Plone (very good CMS), Zope, blooging system PyBloxsom, Dropbox, even Google new Application Engine is written on Python. Of course, we don't forget Trac, which is a project management and a bug tracking system used by many software companies. All these applications have one thing in common. They are all Python products.

When you decide what language is necessary to use for a new project, you usually ask yourself: is there really no way to do this in Python? I don't mean that Python can now do everything anyone could ever do in other languages. There are no replacements for many statistical packages written in R programming language. And in signal processing, there aren't as good packages as we can found in various MATLAB toolboxes. Of course, there are people who work with some very large datasets, and they must code in a low-level compiled language.

Today it looks like Python has a brilliant future because it's supported by a huge community of developers. In fact, the author of the Python is known as a "Benevolent Dictator For Life" (BDFL), because he wants to support his language. Python is very comfortable for writing programs because it has a good data model with special methods that control behavior of objects of all types. There are a lot of useful collection types: sequences, mappings, sets and other simpler types as dicts, str., int. Python is also an object oriented language. It means, that you can use classes, objects and everything that is linked to OO language. You can build your own collections, implement multiple inheritance and operator overloading.

What if you are interested in information security? Python is the first language in the world for information security! If you need a proxy, fuzzer or even some exploit you'll find it in Python. There are available a lot of libraries for reverse engineering and exploitation libraries only in Python and Ruby. This language is very useful when you must write as quickly as possible a penetration test, or focus on execution test and analyze the results.

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DISTRIBUTED COMPUTING WITH MAPREDUCE MODEL

Vladyslav Pavlenko

The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

At first glance it might seem to be another computer thing which is not so important for common people. MapReduce is the newest programming model that makes big contribution to our future.

Distributed computing is quite a new thing that works as follows: we have a task but our computer can not perform it. So we split this task and send its pieces to machines to work on. This operation is performed in parallel, so this technology allows saving time. If we take into account that the bigger numbers we use, the better accuracy we need and the much more time it takes.

Powerful machines cost much that is why this technology is becoming popular, thanks to its ability to operate on different computers and smartphones without special needs in hardware. Nowadays there is a great amount of different OS (operating systems), manufacturers, versions of software and if we want to use non-special hardware (notebooks, phones, tablets), we need to teach them to understand our tasks and result of feedback.

MapReduce programming model solves this problem and another one of correct decomposition of tasks. The idea of this model is to split one task into many different easier tasks, those even smartphone can perform.

This model offers two main functions: Map – the step, when a task is divided into pieces which are sent to slave nodes, and Reduce – the step, when slaves respond to the master node. The last one sticks together those responses to have the solution completed.

This approach to solving the problem was presented by Google and is widely used in researches of National Institutes and Academies.

So, complex calculations like mapping the human genome or decoding signal from space is possible to realize today. Who knows, may be traces of new form of life can be found by calculating on our computer.

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SMART HOUSE: TWO SIDES OF THE SAME COIN

Eugenia Pavlenkova
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The human mind has no limits in its development! Any idea that comes up to a human can be embodied in reality. But is it good? Is it allways necessary?

One of the most popular topics in the world of technologies and artificial intelligence is smart houses.

A smart house (home) is one that provides its owners comfortable and sefe life, at any time, regardless of whether anyone is home. It is equipped with special automation systems to provide the inhabitants with monitoring and remote control

over the building by entering a single command. For example a smart home may turn off and on ligts or security system, change temperature in the room, open or close windows and door and many other functions. So if you have a smart home you can do a lot of things with a lot less effort. Of course it is convenient and easy and that's why everyone likes it, but, as in any other issue, there are also disadvantages. So let's look at the advantages and disadvantagesof smart home.

The key goal of home automation is to make our living simpler and most of all it is necessary for elderly people. So for them smart houses must provide a safe and independent living. Simple devices should be used for managing this building, this helps people quickly learn how to use them.

Most smart houses have built-in cameras, microphones and sensors, so artificial intelligence can use computer vision and hearing to find out what people are doing (activity recognition) or where they are (location estimation), or just to learn the habits of residents to predict their activities and proclivities.

This sounds like fiary tale, but it is a reality. And let's look to the other side of this reality. There are three main disadvantages in usingof smart homes.

The first one is that there are no guarantees that smart home will correctly understand our order or that a human can manage with home if it went out of control. So usage of smart homes are not as safe as it seems.

From a social point of view also there is a problem caused by usage of smart home. Artificial intelligence (which is usually given a name) which build in the house, can communicate with the inhabitants, give advice and etc. And people can use it even when dealing with other people (for example, the person orders food on the internet and smart home opens the door to deliveryman and say where to put food), so a person reduces her communication with the outside world and begins to perceive the machine as a friend. And this leads to mental disorder.

And the third disadvantage is the price of such pleasure.Although almost everyone needs such a house, not everyone can afford to buy it.

Taking into consideration all mentioned above we can say that smart homes are a reality, but they are not enough safe and most of them are intended for the elderly. Home automation is available, but it requires a lot of money and it's not too easy to use it. And it is possible situation when you ask an obedient house to turn off the bedroom light ad instead it makes a pot of streaming noodles, calls the fire department and then activates a self-destruct mechanism.Thus we must be careful and attentive when think about issue of automation and artificial intelligence.

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PARALLEL COMPUTING OPENCL

Anton Pererva

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today people from different countries work with a large number of distributed information. Large bunches of information require powerful computing, or the use of many computing units simultaneously for parallel execution processing.

Creation of super computing unit is't economically profitable and because of physical laws and imperfections equipment is almost impossible, so using several less powerful units that work together to solve a particular problem is acceptable and when we use several tens or thousands of such units the price and speed is becoming more attractive. This is the case when important is the quantity rather than quality.

The solution to many problems such as computer modeling, video processing, visualization, pattern recognition, time series forecasting, financial analysis, etc. requires considerable computing power. Today, parallel computing technologies are becoming more and more popular allowing a user to handle larger volumes of data faster by increasing the total processing power.

OpenCL main feature is its portability due to its abstract memory model and performance, programmer can use technology specific to a particular computer unit. Programmer can run any OpenCL kernel on any compliant implementation. However, the core performance will not necessarily be the same on different devices.

OpenCL is a cross-platform standard for heterogeneous computing, a programming language similar to the standard c99. It allows you to process large volumes of data in a large number of flows, using various devices (CPU, graphic accelerator ...). Executing commands occurs in facilities colled "work-item". Each "work-item" is independent of the other and can simultaneously execute code with them. Where a "work-item" wants to process data that are processed or used by another process, it must do so through shared memory. Shared memory is quite slow but it has big capacity. On the other hand, there is local storage that is very fast and several "work-item" can access. These groups are called "Compute Unit" (splitting on a physical level) or "Workgroup" (splitting logic level). Possible number of "work-item" to "workgroup" is platform dependent value. OpenCL device automates the launch and operation of "work-item" and "workgroup".

Here's the practical part of the report: distributed computing of the Mandelbrot set. Business logic of this process is in the following stages:

- initialize of the initial data
- initialize OpenCL
- create and launch the kernel
- coding OpenCL (calculations)

Initializate initial data. The step required to allocate memory for the incoming and outgoing data sets and completes input. OpenCL Runtime API is a set of classes that correspond to objects OpenCL, supported by calculations of references and exceptions. You must first get a list of available platforms. In which each received platform corresponds to a specific manufacturer. Then for each platform you should get a list of devices. The resulting list of devices it is to do the calculation.

The creation and launch of the kernel. You must first create the context for one device platform. The next step is to create a queue call commands. The queue is tied to a specific device. Each device can be tied with multiple queues, and they can challenge teams sync with each other, but this is possible only within the same context.

Next, you must create buffers of input and output data. When creating buffers you must specify the context of devices for which it is used. Then, create a kernel, indicating its code. The prelast step is to establish the arguments that will be passed to the kernel (data buffers) and their sizes. After that our kernel is ready to launch.

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PROTECTION AGAINST MALICIOUS SOFTWARE

Yevhen Pervak
Faculty of Radio Engineering, NTUU"Igor Sikorsky Kyiv Polytechnic Institute"

With the constant increase of network users increases the risk of attack by malicious personal computer programs. Our age seeks not only the absolute control and automation of everyday life functions performed by man, but also the protection of private information. And with the increasing success in the ground, the risk and the need to improve security systems are playing an important role.

Malicious software is the software developed to gain unauthorized access to computing resources of the computer, as well as data that is stored on it. Such programs are designed to harm a computer or the owner of the information, by copying, distortion, deletion or substitution of information.

Such programs often appear without the consent of the recipient, and even if detected they are difficult to remove. The dramatic decline in performance, chaotic change of user settings and new questionable toolbars or addons is only a few terrible consequences of infection. They can also affect the functioning of the computer regimes and deeply penetrate into the complex mechanisms of the operating system works, so that greatly complicates their detection and destruction.

Performance degradation is probably the most visible consequence of the malware and the most unpleasant one.

Consider the two main types of the anti-malware software:

- point protection;
- complex (total) protection.

As the name suggests, we can conclude that the first type of protection is less reliable. To overcome the point it will be enough to protect only one threat and an experienced attacker, moreover this type of protection in case of violation is unable to determine its depth and scale.

Comprehensive protection includes a fully whole duration of the attack. It provides ongoing analysis and analytics that support the possibility of pre-specified safety action methods. That enables the user to examine the threats that were previously in the system, using a specific set of tools. They can be used not only to determine the scale of the threat, but also to establish control in the case of burglary.

Advantages of the overall protection are as follow:

- ensuring continuous analysis;
- retrospective notification;
- protection before and during the attack;
- analysis and recovery from attacks.

The area of information security is dominant in the market. On its successful development depends not only the protection of private information of users, but also the possibility of scientific discoveries.

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ECOSYSTEM AS SIMULATION MODELING SYSTEM

Olena Petenok

ESC 'Institute for Applied System Analysis', NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Which would be your first association if you hear the word "foresight" or "forecasting"? Some people will start thinking about fantastic tales or science fiction. What if you discover that it's possible but not in the form that is used to imagine? Almost all forecasting systems nowadays are built on the principle of analyzing data. Before immersing in this direction, reader must clearly understand what actually the data is.

This is formalized and structured information about analyzed area. (Simple example of information: "This is a playful white cat that we call James." Data about this information may differ depending on the investigated system: "James is white and playful cat." or "Cat – type. James – name. White – color. Playful – temper." The second way of data representation is mostly used in databases.)

The main differences in forecasting systems are in that what kind of data is analyzed, which amount of this data is analyzed, whether the represented data is about the present or about the past and the percentage of data reliability.

For example, some forecasting systems, such as weather forecasting, built on analyzing the complex of data (in case of weather – the data related to the current state of atmosphere in analyzed area). Other forecasting systems rely on modeling the researched system by creating the digital prototype.

The main idea is to input different types of data to the prototype of system and then make conclusions and logical assumptions about the real system according to the

difference in prototype system's output. Such way of analyzing data is called the Simulation modeling. There are really lots of areas where the Simulation modeling can be used. The main reason is that such systems could describe almost everything. They also may help user to better understand the requirements of the system. For example, an architect could simulate the ways how the building, that is made of different types of materials, would act in different extreme environmental conditions. Then he may choose the ones that fit better. On the other hand, imagine the digital circuit that was made without being tested by simulation of its work. Then it would be the waste of time, money and different types of other resources.

Let's think deeper about the ecosystem modeling. Analyzing ecosystems can help to predict comportment of the community of living organisms in the area where they live, the connections between them and the way of the system development. Nowadays such prediction is very important for scientists because human activities' influence cause the destruction of different types of ecosystems. Because of human activities many forests, rivers, lakes and other ecosystems are destroyed. Ecosystem modeling provides scientists with non-obvious reasons of such destructions that help to provide governmental solutions about protection of ecosystems.

Ecological systems are very complex, because they are composed of a great quantity of biotic and abiotic factors. That's why ecosystem models are much simpler than existing ecosystems are. Models have limited number of components that are well understood and dedicated exactly to the problem that the model must solve or predict.

After the model is created, scientists validate whether it works correctly by comparing the program output with field observations data (on condition of the same data input for the program and the field observation). If the percentage of mistakes satisfies the scientists, they start using the system by purpose otherwise the system must be modified and checked again.

The most simple ecosystem model is the predator-prey model of Alfred J. Lotka and Vito Volterra. The model is represented by two differential equations: $\frac{dX}{dt} = \alpha X - \beta XY$ and $\frac{dY}{dt} = \gamma\beta XY - \delta Y$, where X is the amount of the preys; Y is the amount of the predators; alpha is the prey species' growth rate; beta is the predation rate of Y upon X; gamma is the assimilation efficiency of Y; delta is the mortality rate of the predator species. Although, this model represents the dependencies between the amount of predators and preys, it's too simple to be used nowadays and to provide the scientists with important information about specific ecosystem.

Regardless of the fact that the Lotka and Volterra model isn't used by scientists, it's very clear example of the principle on which such models are built. Of course, modern ecosystem models contain hundreds of such equations, but the ground for them was laid by Lotka and Volterra.

There are thousands of ecosystems all over the world from which people are dependent. But large companies don't care about their own harming activity. They are just using the natural resources they need at the moment without worrying about tomorrow.

Ecosystem modeling is a very important area of investigations because it provides the hope for the future of our planet by forbidding at least part of this activity with the explaining of the reasons.

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EXCELLENCE AND LIMITATION OF QUANTUM COMPUTING SYSTEMS

Anton Petrenko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The future of computing lies in the quantum space. This technology uses the principle of quantum superposition and quantum entanglement for transmission and calculation data. Theoretically, this is way to solve classical computational problems by significantly less time or using smaller amounts of memory. Using quantum computers also provide opportunities to solving qualitatively new tasks for humanity, such as modeling some complicated systems like human body that has unlimited potential for healthcare and pharmaceuticals.

In 2013 an international company Google tested a quantum computer D-Wave 2x, for solving the optimization problem of 945 binary variables compared with classical computing system (single-core processor). The result of the experiment showed a significant advantage (over 100 million times) in the high performance of a quantum computer.

However, we can not assert advantage of quantum computing over the classic, because there are a number of problems for which traditional computers show a great performance. First of all, it is related to limited class of problems for which quantum algorithms is effective.

This problem arises from a narrow theoretical basis of certain issues where a central positiontake nature of decoherence, precisely the wave function collapse, which continues to be not researched enough.

Another open issue is the small amount of data that can be transferred to elementary particles. Recent advances in this area are the work scientists of Dutch University of Twente. They were able to fit in a single quantum of light 10 bit data, what greater than "usual" photon capacity in 10 times! This result was achieved through to record information in a photon wavefront, which uses Spatial Light Modulator (SLM). In experiment they used a grid of 112 × 81 areas of binned pixels, which are the 9072 symbols of some alphabet. This value corresponds to a maximum information content of log2 (9072) = 13.15 bit.

This quantum leap of technology offers significant prospects for the development of quantum cryptography and encryption methods in general, because using SLM allowed for the first time to put into practice a system absolutely strong encryption (the system can transmit key for decrypt simultaneously with the same message), which is impossible in traditional strong encryption methods.

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CIVILLIAN DRONES

Ihor Petrukhno

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, robots perform more and more different tasks of various difficulties. Their story is quite long, but today I would like to tell about what we have and what we can acclaim in drone construction in a nearest future. I will not include here military drones for many purposes and accent an attention on civilian drones. First of all, drone is a robot that perform autonomously, guided by it's program. It does not require operator's intrusion, but can be controlled by necessity. That allows using drones for long-term or cyclic operations.

Now, drones are widely used by police, post, hospitals, rescue service, farmers (in European countries and USA) and many other services. They stalk and catch criminals, deliver various cargo, search for survivors in many disasters and help in work at the field. Current civilian drone models are quite primitive, dependent of energy source and human operator cannot take a heavy cargo and so on. Such weaknesses are merely temporal and set by current technical level. There is no doubt, that with years autonomous machines will be much perfect, than their previous generation. On the other hand, growing number of civilian drones places a question to government's law. What should we do and how should we operate them? No doubt, that quadcopter can be used as tool for paparazzi, to search restricted area or even to transport contraband through the border.

Theoretically, such machines can easily replace humans in all aspects of work. However, what about aftermath? Two major problems come alongside with wider usage of drones. We can easily get too dependent of their service, especially if we can't perform operations by ourselves for example, disabled people. The price of a failure can be too high, if such hi-tech drone operates as surgeon or at the hostile industrial area with hazard materials. That forms terrifying security requirements that can be impossible to follow by constructors and developers and can possibly hold a progress. Do you remember a "WALL-E" cartoon?

In my opinion, drones are necessary for many purposes. However, we must not follow a well-known phrase "laziness is an engine of progress", or humanity will become a bunch of consumers, not interested in future just like most humans in reminded cartoon.

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THE USE OF SINGLE-BOARD COMPUTERS IN WIRELESS SENSOR NETWORKS

Borys Plotka

The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The field of the use of wireless sensor networks is constantly expanding. Wireless sensor network consists of peripheral units connected to these sensors gateway node to collect information from peripheral units, database server and the central unit with installed applications to interact with network interfaces. ZigBee, specifically designed for low-speed data transfer with low cost and high reliability is used for interaction between peripheral units and the central elements of the protocol.

The main disadvantages of this architecture are:

- Time spent and the computing power system for data transmission between the gateway wireless sensor network, database server and a central hub;
- availability of information of the central node for end-users;
- scalability;
- autonomy;
- energy efficiency.

One way to solve these problems is using a single board computer as the central hub and integration of the database server and gateway wireless sensor network upon it. It is proposed for increasing the availability of wireless sensor networks, to use one or more backup networks, such as GSM, in order to transfer key data or messages critical of the system, environment or nodesin parallel to the core, such as Internet.

The main advantages of using single-board computer:

- high performance;
- small size;
- low cost;
- ease of setup and creation of applications;
- the ability to connect a large number of modules.

Formation of a wireless sensor network requires the integration and development of many software and hardware components. Each peripheral unit is a combination of microcontroller, module ZigBee transmission, sensors connected to this module. The central node is represented as the single-board computer with integrated software ZigBee transmission module. This scheme provides for the management and information access for end users.

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PROBLEMS IN JAVA EE

Mykhailo Polishchuk

Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The most usefull platform in the world begins to lose its popularity. Every year you can hear about new technologies, but this year Java EE developers, Oracle company, begins to scare their users by silence about Java EE and quietly closes this project.

Created in Sun organisation open platform, where has been invested so much effort of OpenSource community which works on hundreds of thousands of large projects, servers, enterprise applications and their own small projects which hold the company's goals, may be left without any resources.

Some projects had very bad story in Oracle company. It seems that history repeated, and now it''s connected with one of the most popular products in the world IT industry. Java EE just begins to lose its relevance. As we know that development of Java EE has completely stopped.

Programmers engaged in the state of Java EE Oracle, said that they were transferred to other projects. In the community has started debate about making a fork and how to support existing product. But Oracle refuses to clarify its position clearly and make some official statement, despite the demands of the community.

This attitude of Oracle has led to that people in company have expressed concern about the future of not only corporate platform Java EE, but aboutfuture of all Java platform that brings the issue to another level (because Java holds the top position of all programming languages).

The lack of official position by Oracle about Java EE hurts the whole community and ecosystem of Java, because companies start to create their own frameworks for new technologies and projects. Although now is developing a new version of Java, but such questionable moves about Java EE makes community confused.

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WHAT IS APACHE SPARK AND WHY IT IS IMPORTANT FOR BIG DATA

Olena Polishchuk

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

It is impossible to imagine IT without big Data. Let's see some of the shortcomings of how the MapReduce brought to the development of a new system as Apache Spark.

The first one is that every time you implement a workflow in MapReduce, you have to force your data analysis workflow into a map and a reduce phase. And sometimes, this cannot accommodate every data analysis workflow.

For example, you might want to do a join operation between different data sets. You might want to filter or sample your data, or you might have a more complicated workflow with several steps. Maybe a map and a reduce phase, but maybe another map phase after that. And this cannot be accommodated by MapReduce.

Another important bottleneck, and this is actually very critical for performance, is that MapReduce relies heavily on reading data from disk. And especially if you have Iterative Algorithms that require cycling several times through the data, here you have to run once, get the results of some calculation, then run again using those results. Pipelines like this are popular in machine learning. Reading data from pipelines makes analyst pipeline run very slow. And this is definitely a serious bottleneck for previous step.

The next fact is MapReduce has only one native interface when choosing Java. It's possible to run Python code, but that requires to go through the streaming module that makes or the implementation more complex and not very efficient especially when you are running not with text data but with floating point numbers. And it's be really nice to have simpler languages to use not only Java and to be pass it'd be nice to have an interactive bash which is requently used nowadays by data scientists.

And the solution, what may be the solution for this? The solution is to write a new framework from scratch. And the point is that it doesn't need to be a complete replacement of the Hadoop stock, but just a replacement of the Hadoop MapReduce. So that, being in the one ecosystem can build upon all the available tools.

So needs to be a tool that runs in the Java virtual machine, so it's compatible with all the rest of the tools around the loop and this was developed from UC Berkeley by a computer science lab, and now it's been managed by Apache Foundation, which is the same foundation behind Hadoop.

Apache Spark provides solution for this problems, makes accommodating other workflow, provides a very rich programming interface that gives highly efficient operations via distributed operations. It's a lot easier for data scientists to write their dataport, their data analysis pipeline to Spark and once they build their workflow they can use any number of steps to write their data analysis pipeline.

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INFORMATION TECHNOLOGIES OF PROCESSING OF SINGLE CHANNEL ECG AS A MEANS OF FUNCTIONAL RESTORATION

Diana Pomorska
Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The problem of stress is becoming increasingly scientific and practical relevant for modern society. Because stress is one of the most common reasons of distress, suffering and failures of any person. Various problems surround us at every step and to cope with them and restrict oneself from emotions is not given for everyone.

The term "stress" is widely used in a number of disciplines and means a state of emotional and physical tension, which occurs in certain situations, which are characterized as difficult and beyond the control [1].

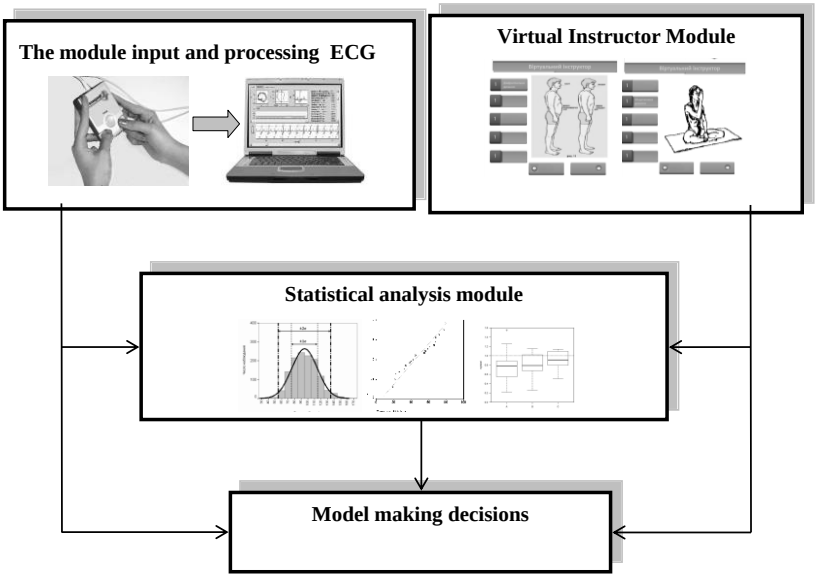
According to approximate estimates conducted by sociologists almost 70% of Ukrainians are constantly under stress, and a third of the total population is in a state of extreme stress [2].

In today's world there are various techniques and methods for solving the problem of stress. Having mastered them, you can feel the recovery of the body and significantly improve your health. One of these techniques is diaphragmatic breathing, which is researched by a large number of experts. One of them is Buteyko [3], who considered that wrong, too deep breathing is the cause of many pathologies. The author and developer of "The programs of improving health and physical fitness" Robert Cooper describes relaxation technique that helps to cause relaxation response in seconds [4]. Another technique is meditation, which is required primarily for relaxation of the nervous system and mind, that as a result will strengthen not only the mentality and nervous system, but immune system in general. Meditation practice requires only 5-10 minutes of free time each day. However, self-mastering of these techniques is not a simple task and requires much time. Besides, it is not clear beforehand, which of these methods is effective for a particular user.

Therefore, the creating of a computer system – virtual instructor, in which several methods and techniques will be integrated, as well as means for automatic analysis of objective indicators of user's functional state before and after certain practices is relevant. Then, based on statistical analysis of these indicators you can measure the effectiveness of each method.

To solve this problem a system based on national FAZAHRAF® diagnostic complex, which implements the original technology of analysis and interpretation of single-channel ECG is proposed [5].

The picture shows the structure of the proposed system



Picture 1. Operation scheme of information system

The first stage is to do electrocardiogram on micro-processing sensor, for receiving means of rapid assessment of degree of tension of regulatory systems and means of restoration of adaptive capacities of the organism. The next step is to conduct reconstructive techniques on a virtual instructor, where you can choose one of the proposed techniques. Then all indicators are measured on micro-processing sensor for further statistical analysis. The result is making decisions about a particular technique.

Implementation of such a virtual instructor will allow to determine changes in heart rhythm, to show their impact on human health and do statistical analysis to assess the effectiveness of these methods and techniques.

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MODERN AUTOMATION

Oleksandr Popov
Faculty of Radio Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today, the topic of global automation is very popular. Automates virtually every action and gear as only possible, and today it is called the "Internet of Things"

(next IoT). For automation use controllers, microcomputers, laptops and other means.

But all these things have one big problem, namely communication ofall elements among themselves, and therefore their interaction. For example the controllersdon't have Wi-Fi module (and has only modbus communication protocol which is RS-485). They can't contact the smartphone to control the temperature for example, because it has no built-in WI-FI. To do this, add various converters that cost money and take some then less place. This issue is relevant for all engineers who design IoT systems for small and large objects.

As its partial decision, some companies that have developed their own complex systems, but they always somethings missing. As an example, a set where there are few reasonable power sockets, but don`t have set to control the temperature. So completely overcome this problem have failed.

The decision of this problem is a general standartization, and adding new, single format for data exchange between devices within the system. This tool should be able to connect multiple devices at the same time, provide the necessary speed data and be protected, and in order to have used, it mustn't be very costly and difficult.

For example in 2004, has developed a new standard for gadgets ports (Micro USB). But given the concept of IoT, leading interface make impractical because of too many wires required from device to device. Correct solution is to develop a common standart based on WI-FI 5GgHZ range, that have basis on this frequency, and combined with protected industrial protocols (secure).

Only necessary need to take into account the need for intermediate amplifiers network that all elements of the system, whether it is reasonable power socket or refrigerator, garage door, will have access to the network. Turning to this standard, all new devices will go with the built-in WI-FI.

But it is not always necessary need to have a such solution, because such devices are used in the same room and have small desired speed connection with other devices, so they would be appropriate to use a standard based on Bluetooth, and combine it somewhere in the room or the building in the control panel and this panel would have contacted with others in the network.

The adoption of a single standard for this area, much would facilitate the work of devices, since at the time it made the decision Micro USB as a single port.

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MODERN INFORMATION TECHNOLOGIES

Oleksandr Poprozhuk, Roman Polishchuk
Faculty of Radio Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today's world is moved to a new stage of life, where the main role is information, and the economy that is built on it. Modern development of the information society is directly linked to the necessity of gathering, processing and transmission of huge volumes of data, conversion information in the product is usually a significant cost. This has resulted in a global shift from an industrial society to an information. The emergence of Internet has caused a massive increase in international communion in various spheres of human life.

Information is one of the most valuable resources of society alongside the traditional types of material resources such as oil, metals, minerals, etc., because the processing of information, like the processing of material resources can be perceived as the technology. Information technology provides the ability to properly handle information and computers.

So what is IT?

In our opinion, in information technology should understand complex interdependent, scientific, technological and engineering disciplines studying methods of effective work of people employed processing and storage of information; computer equipment and methods of organization and interaction with people and production equipment, their practical applications, and connected with all this social, economic and cultural issues.

Most information technology require complex preparation of large initial costs and high-tech equipment. Their introduction should begin with the creation of software, the formation of information flows in systems training.

Today, information technology occupy an important place in our lives. The use of computers has become everyday business, although more recently workstation equipped with a computer was a rarity.

Information technologies have given new opportunities for work and leisure, largely facilitated the work and lives of a modern man. The present society can hardly be imagined without information technology

Information technology quickly become a vital incentive to develop not only the global economy but also other spheres of human activity. Today almost impossible to find a sphere which is not used information technology.

It is not possible to estimate the importance of information technology in education and science. It is difficult to imagine a school where there were no computer class, there are many digital libraries, which you can use from home, which greatly facilitates the process of learning and self-education. And while information technologies contribute to the development of scientific knowledge.

Increasing the speed of information exchange and an opportunity to carry out complex mathematical calculations in a few seconds more. Information technology is one of the modern means of communication, the main advantages are accessibility. Using information technology can easily access the information you are interested in and talk to a live person.

On the one hand it has a negative effect because people talk less "live" by direct contact, but on the other hand will communicate with someone who is on the other side of the world, and this will agree, is crucial.

Modern information technology is quickly absorbed the achievements of electronics and mathematics, philosophy, psychology and economics. Formed as a result of viable hybrid marked a revolutionary leap in the history of information technology, which has hundreds of thousands of years.

Manufacturing and transport, banks and the stock exchange, media and publishing, defense systems, social and law-enforcement database, service and health care, educational processes offices for processing of scientific and business information, finally, the Internet – around information technology. Information richness not only changed the world, but also created new problems that can not be predicted.

Modern society simply crowded streams of information that will undoubtedly require treatment. Because without information technology, as well as without energy, transport and chemical technologies, our society can not function properly and will not.

With the development of modern information technology is increasing the transparency of the world, the speed and volume of information transfer between the elements of the world system, there is another factor integrating world. This means that the role of local traditions that promote self-sufficient inertial development of individual elements weakens. At the same time enhanced response to signals from elements of positive feedback. Integration could be welcome if it were the result of not getting the erosion of regional, cultural and historical features of development.

Modern information technologies are one of the most profitable and fastest growing economic sectors. Information has become an important industrial and commercial property.

It is necessary to consider the impact of information technology on the development of social networks is an effective tool and a great marketing tool.

Social Network – a structure based on social relations and mutual interests of individuals and organizations in general. The task of this resource is to provide users of all possible means of interaction with one another – video chats, images, music, blogs and more.

Over the past few years, social networks have become the most popular resources on the Internet today Facebook, Twitter and Linkedin in the US and Western Europe, as Vkontakte and Odnoklassniki in CIS – a site with millions of active users. These resources visited by 75% of Ukrainian Internet users.

Social networks really filled our world. This is due to the rapid development of information technology in general. Due to globalization, information technology various social problems and contradictions often displayed as information-psychological operations or, quite popular today – wars.

It is difficult to find a sphere, which is not used information technology. Summing up, we can say that information technology has penetrated deeply into our lives and modern society that can not exist in its present form without them.

Modern society can hardly be imagined without information technology. Prospects of development today is difficult to imagine even the experts. However, it is clear that in the future we are waiting for something grand. And if the pace of development of information technology is not reduced (and this no doubt), then it will happen very soon.

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.NET CORE AS A BREAKTHROUGH IN .NET FRAMEWORK EVOLUTION

Kateryna Prokhorova
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

.NET Framework is a widely used framework for the development of applications deployed on the Windows platform. Strict linking to the platform is both upside and downside of the framework, as it is strongly supported and compatible with Windows family operating systems, whereas limited by it. However, at present Microsoft is in the midst of solving the restricting platform dependency framework's problem by releasing a completely new product, which first version is known as .NET Core 1.0. It is designed for Windows, macOS and Linux operating systems and can be used to create IoT, cloud and embedded scenarios.

The problem of making .NET Framework cross-platform was already addressed in Mono project, Xamarin, Android emulator, Potable .NET but they are not capable of providing complex solution covering reach functionality of the framework, besides some of them face the problem of standardization. Due to these facts .NET Core seems like a quite perspective project with a bright future. It is currently not so mature to compete with Mono, but it has the important advantage of providing a basic approach that makes further rapid boosting possible and easily approachable with the help of developers community involved. It should be emphasized that .NET Core is not an extended version of latest .NET Framework 4.6.2. It is completely new realization based on .NET Framework best practices and tailored to new needs and requirements. It is remarkable that .NET Core is open-source, so users can expect the rapid development of the framework or contribute if they wish. Like it's ancestor it includes runtime, framework library, just-in-time compiler, language compilers and a set of SDK tools. The modular, unified analog of CLR is called CoreCRL, class library is now called CoreFX, which is currently notably smaller than the parent's one. CoreCRL and CoreFX are both provided in a form of a NuGet package, thus there is no need of centralized installation. In virtue of it, the user is free to choose appropriate version or include only necessary components to a solution. Besides, created projects might be fully configurated from

the command line. In addition to all made renovations, the framework is equipped with application host to yield cross-platform features. All novel applied approaches in design and development of .NET Core result in numerous advantages. The most significant and obvious one is cross-platform support of aforementioned platforms, which will grow over time. In addition, it is modular and highly configurable, so the user can include only necessary components and utilize desired development means. Moreover, .NET Core is compatible with .NET Framework, Xamarin and Mono. It means older components written for this platforms that were constructed from types already available in CoreFX might be easily embedded in a .NET Core project.

Microsoft has announced that the priority of .NET Core project is higher then .NET Framework's, it means that there will be more realizes of .NET Core and in future it will be a moment when .NET Frameworkwill have less functionality then its cross-platform modernized counterpart. Unfortunately, presently .NET Core is not as rich as .NET Framework, so .NET Framework 4.6.2 remains the best choice for development of big commercial projects. But if portability is significant requirement and time is not so limited, using of .NET Core is quite reasonable, especially if utilization of already written components is possible.

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PHP: ADVANTAGES AND DISADVANTAGES

Oleksii Pukha
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Every day, thousands of people improve their knowledge in programming.

Today, a biggest popular language in web-technologies is PHP. 78% of internet – it PHP.

In 2008-2012 this language had the greatest rate of development. Biggest-popular Content Management Systems (CMS) were developed in language of programming of PHP. And today they occupy the considerable fate of market, namely:

- WordPress. This control system on the first place and on it developed 25% all sites of the world;
- Joomla occupies the second place and it is use 7% developers;
- Drupal on the third place from 5%.

This language is the simplest for people which do not have technical education, speed of work is high, especially with lines. And yet this language allows quick all to lift dynamic web-additions and it all needs minimum money and efforts.

Popularity of PHP pleased to many the developers.They not only used it as an instrument but also wrote the framework, for the increase of fast acting, of economy of time and creation of the structured code.

PHP remains the best web platform for today.

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MODERN INFORMATION TECHNOLOGIES IN EDUCATION

Anna Pysarenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Currently, the process of information is manifesting in all spheres of human activity. So the use of modern information technology is a prerequisite for the development of more effective approaches to teaching and improving teaching methods. A special role in this process is played by information and communication technology (ICT) – the driving force and coordinator of the increasing globalization of the educational environment. Using the ICT contributes to students learning motivation, saving training time and promotes interactivity and visibility to better understanding and learning. Teachers understand that the combination of digital technology and resources provides more opportunities to improve the quality of teaching and learning than any previous educational technologies. Digital learning materials different from its traditional ability to manage them.

ICT is a coordinator, cause of the internet is a unique tool for wide accessible dissemination of educational materials. The Internet has become an interaction methods. Its potential for teaching and learning has increased. Development of automatic and non-automatic set of interactions between machines, people and systems for different processes is very important. Many organizations have already identified targets for implantation ICT in the learning process and developed for teachers norms and standards for the use of appropriate tools.

Learning Management Systems (LMS) (Blackboard, Moodle and Sakai) concentration provide training materials and courses, as well as covering the management of the course, registration, course scheduling, discussion forums, assessment. The main functions of LMS include the controlling access via password to the course. LMS tracks which material a student has access to and how much time is spent on them. It analyzes educational activities to collect data available LMS. LMS is also used as a data repository for learning resources and materials. For example, a developer of the course may provide commercial materials or open educational resources. Materials can be presented in different formats – from simple text to interactive media [1, 2].

Social media provides an opportunity for people to communicate using ICT. In other words, social media – is a means of social interaction. Practice of private, elite, individual education through social media is becoming more and more common, what inevitably entails a reduction in the role of traditional public education. This trend threatens the realization of one of the most important functions of education – socialization. In this context, social media provides young people the opportunity to support numerous contacts with peers, based on shared interests.

Social media began spreading rapidly as a result of system derivation that create the possibility of virtual presence. The term "virtual presence" means indirect interaction of people through media channels of communication, replacing full-time communication (e.g., videoconferencing and networking platforms as Twitter, Facebook and so on).

Nowadays, educational institutions can no longer effectively function without ICT. Educational services are provided for students and teachers through the Internet. Purchasing and maintenance of various computer hardware and software constantly requires significant financial investments and attraction of qualified professionals. Educational institutions are increasingly using cloud services, getting them for free or for a small fee. These services are more accessible and reliable than their placement in the institution.

Another factor of the diversification of educational platforms is changing communication and informational computer infrastructure. In particular, the development of smart media contributes to a significant spread of mobile platforms, which contribute to the convergence of content.

For example, film "Toy Story" of Walt Disney Studios on the iPad coined a new type of digital books in the 2010, now known as "motion book" [2]. This book is a combination of text, pictures, audio, video, drawing elements in one place. Moreover, many users of smart media use social networking services, online office software, such as Google docs, check e-mail via mobile devices. Users prefer to have continuous access to services.

The main trend in education says, that the most important potential sentences of ICT application is convenience and performance that is obvious time savings. Therefore providing learning platform integrated access to resources is necessary for the educational process and for students.

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WIRELESS INTERNET: THE ROAD TOWARDS 4G

Stepan Pysarenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today Internet connection is essential for every modern person. Only several people with access to Internet just two decades ago and today almost every student with smartphone can use the World Wide Web in any way he wants. It's hard to name the thing you can't find out via the Internet, so it is obvious that we can use it every day and everywhere. That's why people decided to develop different methods of connecting to Internet wirelessly. One of the methods is called the 4G or the fourth generation of mobile communications technology.

The research in wireless communication took start in 1950s, when US troops used mobile radiophones with huge antenna to have an instant communication with their command post. That method was called the 0G and from that time it evolved, even today this process is inevitable. The 1G was born in 1980s and used analog technology while the 2G (introduced in 1990s) used the digital encryption of information and even offered the possibility of send and receive text and picture messages! Based on GSM standard 2G totally ousted 1G from the sphere of wireless communications. And exactly this generation first included the internet surfing ability which allowed mobile phone user to read news, download images, sounds and games on special WAP websites, which were optimized for the slow internet speed. Then 3G was introduced.

The up-to-date version of mobile communication is the fourth generation or the 4G. This generation provides high-speed connectivity and allows user to participate at videoconferences, watch high-quality videos online, download and upload large files. Despite the start of growth back in 2010 this generation is still growing and developing. Still today it can't be massively used in majority of countries because of different economic details. Despite the progress, the majority of smartphone users prefer 3G due to the lower price. In addition, it is required for base stations to use 4G ready equipment but it is expensive and considering percentage of 4G ready smartphones used by customers it is not financially profitable yet. The further explorations, investments and natural market changes can provide the growth for 4G.

The world of communications can't make one huge step forward in upgrading the world's data-transferring techniques – it has to make a bunch of small steps to finally use the new technology with all its potential. Nowadays there are some disputes about the development of the wireless telecommunication: while some people talk about 5G the project Outernet slowly becomes the most popular theme on forum threads and websites. Outernet is using lots of satellites on the Earth's orbit to make a huge Wi-Fi field all around the world. It is not certain which one of these technologies will be the next breakdown or can make some processes much faster and more efficient in the nearest future.

In conclusion, 4G communication technologies have extremely great future but require some time to grow. Still we should consider that speeds offered by 4G usually exceed customers' needs so this growth will not be the fast one.

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SMART CITY REALIZATION PLAN

Oleksandr Rak

ESC 'Institute for Applied System Analysis', NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Expected doubling of the total population of the world and growing of the world urbanization increases demand for intelligent, sustainable solutions that reduce bad effects on environment andensure a high quality life for citizens. A smart city makes a fusion of technology, government and society to enable the following characteristics:

- a smart economy;
- smart mobility;
- a smart environment;
- smart people;
- smart living;
- smart governance

"Smart city" is the concept, which helps people save environment from negative impact and increases life quality with modern technologies.

But smart city is not "panacea", but it seems to be like this, because according to Gartner's Hype Cycle of technologies, every technology passes through 4 checkpoints:

- Technology Trigger;
- Peak of Inflated Expectations;
- Trough of Disillusionment;
- Slope of Enlightenment;
- Plateau of Productivity.

It is needed to say, that smart city is not a unified conception, but a stack of different special conception with its own set of technologies to realize. "Smart city" term has not a single definition. Every scientist has its own definition, but there only similar characteristics of different definitions will be described.

Nowadays smart cities technology conception passed about 25% of path between Technology Trigger and Peak of Inflated Expectations, so it's the great opportunity to do different researches in adjacent technologies.

The main scientific method in smart city researches is data-driven analysis with using of Internet of Things and Big Data. There is no any working prototype of smart city in the world. Nowadays main researches are about "smartization" of transportation, energy use and government in cities not in union, but separately.

Internet of Thing is, first of all, a great bundle of different gadgets with sensors, which connected to the internet and can receive different kind of data. Such data and algorithms of processing of this data called Big Data. Big amount of data, which received from sensors, can be analyzed with data analyze algorithms to find patterns of people's behavior or and develop better mathematical models of processes in city or better recommendation algorithms to make living experience and quality better.It is a brief survey of the main smart city technologies.

First problem why cities is not smart is in government, because government manages all city process, so first problem to make city smart city smart is to make government smart – develop e-government. E-government helps to receive feedback and data in digital form. E-government makes people's lives easier, because routine operation automated and faster to performing.

In Kyiv and other big cities of Europe the problem of bad transportation (especially traffic jams) is broadly exists. Feedback from people, webcams on city roads and recognition algorithms, passenger registration systems in public transport give needed data about transportation. This data can be used for development of city transportation system, which will help people to save cost and decrease negative impact of transport to the environment. If simplify, road system in city is graph, so mathematical model of transportation system of city is graph and with graph algorithms and modern urbanistic ideas we can get perfect system and improve this system according to new received data.

Other example: real-time receiving of data from the crossroad webcam and processing it can help to avoid traffic jams by the changing traffic lights period on one of the roads.

Unified database with data from different city components is the great chance for research, because it can help to find unknown patterns of human behavior.

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DEVELOPING WORD TEMPLATES BY C#

Kate Romaniuk, Mykyta Pekarchuk
Faculty of Heat and Power Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Since 1991 Microsoft has not stopped to develop Microsoft Office programming technologies. From this time, Microsoft has developed a lot of additions to the Office package. In the new version of Microsoft Visual Studio you have possibilities for processing documents. With programming languages which are

presented in Visual Studio (Visual Basic and C#) you can create projects for developing templates of Microsoft Office documents (Excel 2013 Template, Excel 2013 Workbook, Excel 2013 Add-in, Word 2013 Document, Word 2013 Template, Word 2013 Add-in, PowerPoint Template, Outlook Template, InfoPath Template, Project Template, Visio Template).

The main library for work with Microsoft Word at Visual Studio is Microsoft.Office.Interop.Word. It will be useful when you need to fill or to design the document programmatically. As result, you have bulky code. And if you want to change something, you need to rewrite a big part of code. It is not a good variant.

One of the latest and the simplest addition is a TemplateEngine.Docx. It is used only for unloading data in document. So, you can create Word document, fill it for necessary template, set style and access rights. In the next step you must add Content Control for data which fill the document. In program, you must only create object of class Content, pass data for it and call FillContent method. Thanks to assemblage TemplateEngine, program code will become understandable and compact.

As result of research we discovered several advantages and disadvantages of TemplateEngine.Docx. package. The main advantages:

– Document is created and designed in Word without necessity to rewrite code. It gives you an opportunity to know how the final result will look.
– The possibility of further changes of document's styles without using of code.
– Easy interaction with data via Content Controls.
– Setting access rights for some parts of document.
– The possibility to fill simple fields, tables, nested lists, tables with lists, lists with tables. That is the structure of class Content allows you to create templates with unlimited nesting of elements.

The one disadvantage of this package is that it can't work with images.

So, using mentioned above instruments you can create program product which will be easy interact with Microsoft Office documents.

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ASP.NET CORE – A NEW ERA IN THE DEVELOPMENT OF ASP.NET

Oleksandr Rotenberg
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

ASP.NET Core Platform is the technology from Microsoft, designed to create various types of Web applications: from small websites to large web portals.

ASP.NET Core is now open-source framework and has full cross-platform. All

the source code is available on GitHub. We can run web applications not only on Windows OS, but on UNIX systems like MacOS and LinuxOS. Also it has a modular runtime environment that simplifies deployment of application.

Due to the modularity you can download all separate modules via the package manager – NuGet. In addition, unlike earlier versions it is not necessary to use old System.Web.dll library.

ASP.NET Core is more optimized for use in the cloud and has a support of DI (dependency injection). When deploying web applications you can use the traditional IIS. But you also have an opportunity to run a web application on Kestrel (a new web server).

ASP.NET Core includes an MVC framework, which combines the functionality of the usual Microsoft stack like Web API, Web Pages and MVC. In previous versions of the platform data released separately and therefore contained much duplicate functionality. Now they are united in a single programming model ASP.NET Core MVC. A Web Forms is completely gone.

In addition to combining the above technologies in one model in MVC a number of additional functions was added.

One of this features is the tag-helper, which allows to connect more organically HTML syntax with C# code. Also applications have a support of tools like Gulp, Grunt and Bower which allow to automate and optimize development process.

For the processing of requests a new pipeline is used, which is based on components of OWIN specification. And its modularity makes it easy to add new pipeline components.

To sum up, we can highlight the following key differences of ASP.NET Core and old ASP.NET framework:

- lightweight http-requests pipeline;
- deployment an application as iis, as well as within its own process;
- distribution package platform through nuget;
- simplified configuration for use in the cloud;
- dependency injection support;
- framework supported by community and opened for changes.

However, it should be noted that the previous model used in ASP.NET 4.5 – MVC 5, Web API 2 remains and continues to be developed even in the .NET 4.6. And we can either start using ASP.NET Core, or continue to develop with the previous and more familiar old ASP.NET.

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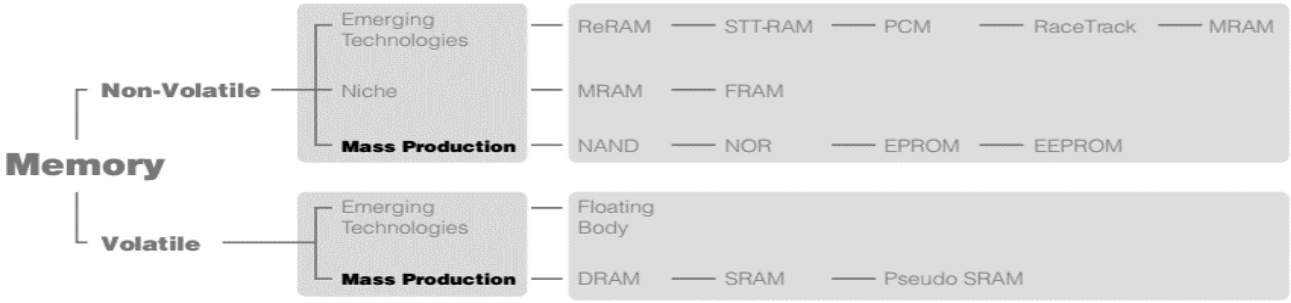
MODERN TRENDS IN COMPUTER NETWORKS

Olexander Shpartko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The need to create networks was due to the need to share information on remote computers apart. Network PCs provide an opportunity not only information sharing but also sharing of equipment simultaneously work on documents and communication between people or groups of people.

With the expansion of the global network and increasing the number of subscriber points, there were changes in the network equipment and the improvement of network protocols. Accordingly, this article presents the latest developments in the system network connections, their security and remote data storage systems.

Firstly, scientists predict the emergence of "Non-Volatile memory". Feature of the given data storage system will be able to retain data even when power outage. This type of computer memory is more stable and economical compared with conventional RAM.



Secondly, one of the most frequently discussed topics in the world of computer networks is NFV topic – a new and promising technology. It allows you to programmatically create such services, which are now only available in the form of hardware solutions. Virtualization networking features allows the services there, then, and in the quantities that are needed now and in this place. NFV was created with a focus on service providers with knowledge of the peculiarities of the work of service providers and their most pressing problems.

Benefits of NFV:

– it allows you to flexibly and rapidly deliver new services while reducing capital and operating costs;

– replacement of equipment on standardized servers and network components does not bind operators to suppliers of equipment;

– reduce operating costs by simplifying the monitoring and administration of operations;

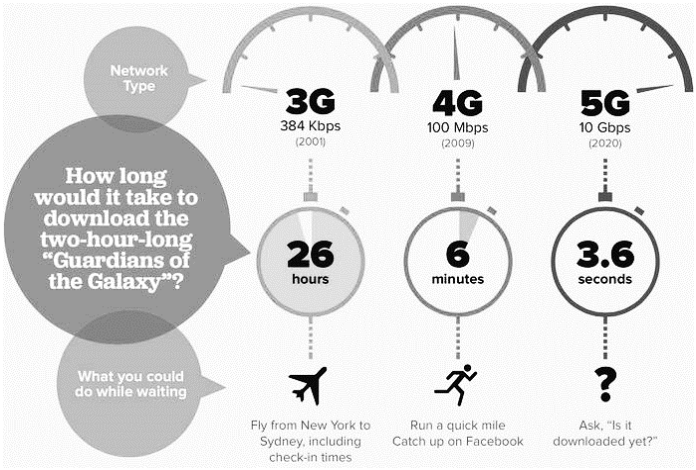
– fast connection of new users to the network;

– it pays for the infrastructure of telecommunication companies.

In addition, Containers (Container virtualization) are gaining popularity because they make it possible to develop more advanced applications available to users at any time and from any device. The focus is on maximum flexibility, microservise architecture work through the API. This architecture allows you to run

the same application on mobile and stationary devices, as well as in the cloud with the placement of data in a hybrid environment of multiple data centers (or even different cloud providers). And it does not require special software versions for different platforms.

Finally, Capability-based Security: This model is guided by the principle of least privilege. For example, opening a file in a text editor, you give the program-editor access to only one particular file. You still can not be sure that the program will edit the file as you expect, not encrypt and demand money for decrypting – but the rate is now significantly lower. To this end mandatory references are used in this system. Mandate reference – is a special form of links, which at first identifies the object, and the second determines the permitted operations on it. Can co-exist mandatory references that refer to the same object, but set different sets of permissible operations.



Lastly, companies engaged in the development of the new standard, ready to launch 5G network in 2020th year. Fifth generation standart will cover the millimeter waves, for this speed is required the rejection of a large number of frequency bands.

This approach is very expensive and complicated. Consequently users do not expect broad coverage area of a new type of communication. This is due to the fact that the range of signal until the new small, so 5G networks will be first used only in places where demand is greatest Internet.

To sum up, following from that, what progress could achieve network technology in recent years, not difficult to guess that as soon as the data rate of a computer network to grow at least twice. All these inventions aimed at creating a remote Cloud system, ensure safety and increase the speed of communication with them.

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DRIVERLESS CARS

Kateryna Shumada
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Driverless, autonomous, or self-driving cars have existed for a long time in engineering design departments. Despite that, we still have not felt a significant influence of the technology implemented in our everyday lives.

The main objective of the project is quite obvious – to create a vehicle, which would operate without a human driver. The idea has an uncountable number of benefits. Firstly, it would noticeably decrease the number of accidents caused by human factors (the majority of car crashes) by automating the process of driving at night, in bad weather conditions, under stress, etc. Secondly, it would save time, energy, and attention of potential driver. Thirdly, it should reduce traffic congestion and the number of traffic rules violations. Fourthly, life would be easier without today's driving requirements and restrictions, such as age, driving tests, alcohol consumption limits, and many others factors.

By March 2016 several states of USA, including California, Michigan, Florida, Nevada, Arizona, North Dakota, Tennessee, Utah, and DC, proclaimed the legacy of implementation and testing of driverless cars. Some cities in such countries as Germany, the Netherlands, and Spain have also allowed using the new technology for testing purposes (Eggert, the Washington Post, September 7, 2016).

The integration of self-driving cars in everyday life terrifies many people. According to the Washington Post article regarding reactions of Pittsburgh residents on self-driving Uber cars, the most common fears and worries expressed are as follows:

- safety and technology concerns;
- navigating concerns;
- unemployment concerns.

Safety and technology aspects are the most important in the transportation industry. The aforementioned safety aspects include the introduction of new revolutionary software and technical decisions regarding driverless cars.

In addition, many people falsely suppose that the use of self-driving cars will dramatically increase the unemployment rate. With the Uber example, many occupational drivers fear that new technology may make take them out of the market. That is a completely wrong perception, because there still will be a need for route operators and controllers. According to Uber's chief executive, Travis Kalanick, there is no reason for occupational drivers to quit their jobs soon. Furthermore, he emphasizes the need of creating new positions, such as fleet maintenance.

Nowadays there are several competitive companies working out the ideal self-driving car. Among them are Google and Uber self-driving car, Tesla Autopilot, and even possibly an Apple secret autonomous vehicle project.

As it was mentioned above, world leading companies are currently working out new strategies for self-driving cars.

One of the most impressive and already ready-for-use technologies is a semi-driven car named Tesla Autopilot. This invention is not exactly a driverless example, but one of its main features is adaptive control system of cruise control. Initially, Tesla Autopilot was developed to decrease car accidents in long journeys. Many engineers, who have been working for Tesla Motors, have been now invited to Google, Uber, and Apple design departments to share their experience and ideas (Bailey, the Washington Post, September 10, 2016).

By Brian Fung, the Uber drivers in Pittsburgh suggest that a huge number of their customers (from 70 up to 95 percent) are skeptical of successful implementation of driverless technology in their routine life.

On the other hand, the idea is so great, not many potential users can support and fully believe in it (the same was with first space exploration programs).

Apart from this, car developers should pay attention to their future customers' age groups. For example, Brian Fung (the Washington Post, September 13, 2016) also supposes that suppliers of new technologies may face difficulties with the age groups of potential users. Taking into account that many people generally have skeptical attitudes about the implementation of driverless cars, the majority of seniors are not excited at all. "If Uber or other companies want to be successful with the older population, they need to do a lot of demonstrations" (Fung, 2016). This means that only successful testing results and further performance might change the people's attitude.

In addition, even young people are predicted to be hesitant to try a self-driving car. However, college and university students are estimated to be the first ones, who would venture.

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FACTORIZATION OF COMPLEX PROBLEMS BY USING BAYES NETWORK

Illya Shuplietsov

Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Graphical probabilistic model is a probabilistic model in which the dependences between random variable are represented as a graph. Graphical models are extensively used in probability theory, statistics and machine learning. Also, the examples of the use of graphical models are processing video, social network analysis, bioinformatics and other. Let's consider the detailed graphical model, called Bayesian network.

Bayes network is a graphic probabilistic model, which is a set of variables and

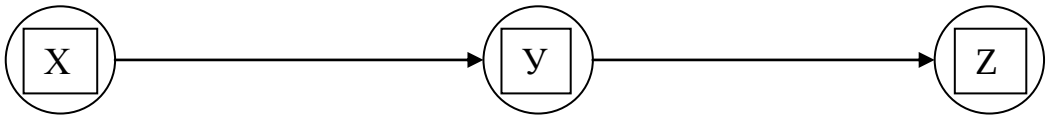
their probabilistic Bayes dependence. Speaking formally Bayesian network is a directed acyclic graph, each vertex of which corresponds to the independent variable, and the graph curves correspond to conditional independence between these variables.

Let's consider the Bayes network of two or three variables. To begin with let's consider a network with two variables, x and y. For two variables we have two cases where there are ribs or aren't between them. If there is no edge it means that x and y are independent and this graph corresponds to decomposition p (x, y) = p (x) p (y). If there is an edge we get the decomposition p (x, y) = p (x) p (y | x).

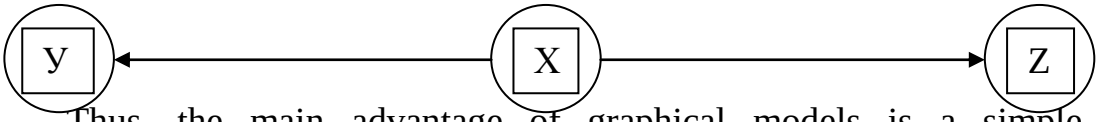
Let's consider cases where serial communication and communication exist between variables that are divergent for Bayes network with three interchangeable.

Let's start with serial communication where x influences y, and in turn affects z. This graph corresponds to decomposition p (x, y, z) = p (x) p (y | x) p (z | y). Intuitively, this corresponds to causation. X and y and y and z are connected with each other. But they are linked to this network x and z. In such a network x and z are connected only via y and if we know the importance of it, x and z are independent. Formally, this corresponds to conditional independence of x and z provided by y.

It is possible to write it with a formula: p (x, z | y) = p (x, z, y) / p (y) = (p (x) p (y | x) p (z | y)) / p (y) = p (x | y) p (z | y). The first conditional congruence corresponds to probable inequality, the second one to outlined degradation, and the third one to application of Bayes' theorem. Serial communication shows that extreme variables are conditionally independent in terms of being in the middle.



The next option is when communication odds that x affects y and z. This graph corresponds to decomposition p (x, y, z) = p (x) p (y | x) p (z | x). Intuitively it meets two investigators with a reason. In this network, it is clear that x and y and z and x are dependent, and the question is in the dependence between y and z. As in previous network y and z are interconnected through x, and if we know the value of the common causes of x, y and z become independent. Formally, this corresponds to conditional independence y and z in terms of x. It is possible to express it with a formula: p (y, z | x) = p (y, z, x) / p (x) = (p (x) p (y | x) p (z | x)) / p (x) = p (y | x) p (z | x). Such communication means that investigations are conditionally independent in terms of common case.



Thus, the main advantage of graphical models is a simple allocation conditionally independent variables, which facilitate further analysis. Bayes network

is a simple and convenient for factorizationof complexproblems. The examples of Bayes network use are: Kalman filter, factor analysis, hidden Markov models and etc.

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IT: FROM DEVELOPMENT TO PRODUCTION

Vladyslav Shyshkin

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays a lot of people want to start their business in IT sphere, because it's profitable and interesting sphere. But there are a lot of hidden obstacles.

In economics: it's very expensive. If you are dull fish or your business idea is boring, no matter how much money you have, your plans will be doomed to failure.

In marketing: it's so difficult to start unless your idea is unique and fresh. So you and your team have to work hard to beat companies which have had clients for a long period of time. In most cases it's impossible. You have to know religious and cultural characteristics of future clients.

In IT: IT is the fastest growing sphere. New updates are coming every moment. Yesterday team could use some technologies but today they are outdated. Development of program includes using of few or more programming languages. So it leads to increase of your team.

In staff recruitment: idea, code and plans have been remaining within organization. Data leaks will lead to collapse of business. The history has many examples of such unsuccessful attempts.

In law: all actions of company must be open and transparent, and don't have to break the law. Country and all citizens of country should see your good intentions. It's the foundation for the effective delivery of high-quality program results.

Bugs and hackers: the hackers can steal clients information and use it to do anything bad. Unless you want it to happen, you need to protect data, use special methods of encoding and decoding. So it can be very expensive but it's worth it.

So it's a great advice to create your own IT business. Don't work alone, you should find like-minded people and organise work process. It's hard but interesting and worth it.

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SCHEDULING PROBLEMS OF IMPLEMENTATION OF IT-PROJECTS

Tetiana Siagailo, Vitaliy Kushnir
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, development of any software requires a plan which is used to create a product. This process is called "Project management".

For development of software a company looks for IT-specialists and selects a team which should have all required skills for successful creation of the product. After this every member of team gets a list of tasks which he should implement. Every task has duration and deadline (time, when the task should be ready). So in order to perform all tasks on time, a participant has to know when he should start and finish each task. For successful execution of all tasks optimal schedule which doesn't fail to meet a deadline of any task is created. Every schedule has to meet some predefined criteria. Here is example of the algorithm, which builds the optimal schedule with two criteria, the first of which is a maximal start moment and the second one is minimal total earliness.Themaximal start moment is a maximal possible moment of start of performance of the tasks, which doesn't fail to meet a deadline of a task. The built schedule is optimal because it's optimal by two criteria.

Below is a brief description of the algorithm. The algorithm is divided to three smaller algorithms. The first one looks for maximal moment of start and builds an optimal schedule according to this moment. The second one uses the previous schedule to build the schedule with minimal total earliness. And the last one verifies if the algorithm is optimal by two criteria. In case when the obtained schedule is not optimal by the two criteria the algorithm looks for a new start moment which is used to build a new schedule which is verified to be optimal by two criteria. If optimality meets predefined criteria then a start moment is maximal.

Output of this algorithm is schedules of consequent tasks with start and end moments of their execution. Similar algorithms which build a schedule by two criteria have not been found.

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DATA SECURITY AT CLOUD STORAGE TECHNOLOGY

Roman Sierikov, Yevhen Hryshchenko
Faculty of Heat and Power Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays there is an important question as for safety and security of data. In recentyears the vivid instance of such a technology that meets this criterion is saving technology called cloud system.

Everyday hundreds of thousand people use 'cloud' opportunities that allow not

only to save data such as documents, pictures, music, so on, but also to get fast access to them using any device like tablet, smartphone, laptop, etc. Today there are too many "cloud" storages represented by different IT (informational technologies) companies. For research service security next popular "cloud" storage providers – Google Drive, OneDrive, Dropbox and Megawere selected.

In the case with IT giant like Google and its "cloud" storage system it was determined that service has two verification levels – namely a strong account password and additional code that comes in a SMS to the phone each time a user logs in his account. However, files aren't encrypted, so it is worth encrypting them before uploading to "cloud".

The next was storage serviceof Microsoft – One Drive. There was determined that italso uses two-stage authentication.First level that is in entering password requires password using mixed-case characters.It is for greater security of client's data. Also OneDrive offers the ability to view previous versions of document.

One of the most popular representatives of "cloud" storages is Dropbox. Company says that security – their top priority. It recommends the user to use reliable password. It is possible to activate two-factor authenticationin the settings. It means that message with code will be sent to mobile phone per each input.

At the settings page you can watch and manage storage connections, journal of visits to prevent unauthorized access. Company argued that encrypts files during downloading them to storage.

Last examinee was service called Mega. During registration it requires creating strong password. Storage uses secure connection (HTTPS) and encrypting technology for client side. During downloading from server data is decrypted. Service doesn't have two-step verification, but has log of visits option.

Each service has private access to user's storage data, it means that no one can view user's information. Only storage owner is able to provide review and edit any file.

During the research user's data security of different "cloud" storages was evaluated and it wasdetermined the most secure storage. Considering the results the best "cloud" storage is Google Drive, because it provides the greatest number of ways to secure data, except encrypting. However, "Mega" service supports encryption, but lack of two-step verification significantly reduces data security from unauthorized access.

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VIRTUAL REALITY

Eugene Siriy
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Virtual reality is a technology that allows you to interact with a computer-simulated 3D environment. In other words, special software is used to simulate physical presence of a user in the artificial world. The whole point of creating virtual reality is the possibility of doing something that you are not able to do in real world.

In order to get to the virtual reality you will need a special device called head-mounted display. Unlike the image on regular display, the image on virtual reality display depends on user's head position in real time, which is detected by the system and rendered.

The principle of device operation can vary depending on the manufacturer, but the basic elements are the same: computing device creates a virtual 3D space in which there are objects that represent the position of user's eyes in real world. Data related to user head position is obtained by using gyroscope and accelerometer installed in the device.

A device processes parameters of each virtual eye and displays the created image for each user's eye separately. Oculus VR proposed the idea of head-mounted displays based on the mentioned above principle in 2012 on Kickstarter. Oculus Rift was one of the first virtual reality headsets, but nowadays there is a really wide variety of them. Here's a list of the most popular ones: Sony's Project Morpheus, Microsoft HoloLens, The Vive by Valve, Samsung GearVR, Google Cardboard, Magic Leap.

Let's see how virtual reality can be used in different spheres of our lives:

- Data visualization
  Virtual reality is widely used in architecture.
- Computer gaming
  With a VR headset you can not only play the game, you can become a part of one. Breathtaking first-person gameplay.
- Education
  Imagine a history lesson with a VR headset – history is happening right before your own eyes
- Medicine
  Treatment of mental illness, virtual operations.
- Military
  Virtual aviation flight training, virtual raids without risks
- Exploration of other planets
  NASA used VR to explore the surface of Mars.

As for the disadvantages, virtual reality leads to a loss of boundaries between real and virtual worlds. Also, head-mounted displays can cause motion sickness and nausea.

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GPS PROBLEMS IN MOBILE APPS AND WAYS TO SOLVE THEM

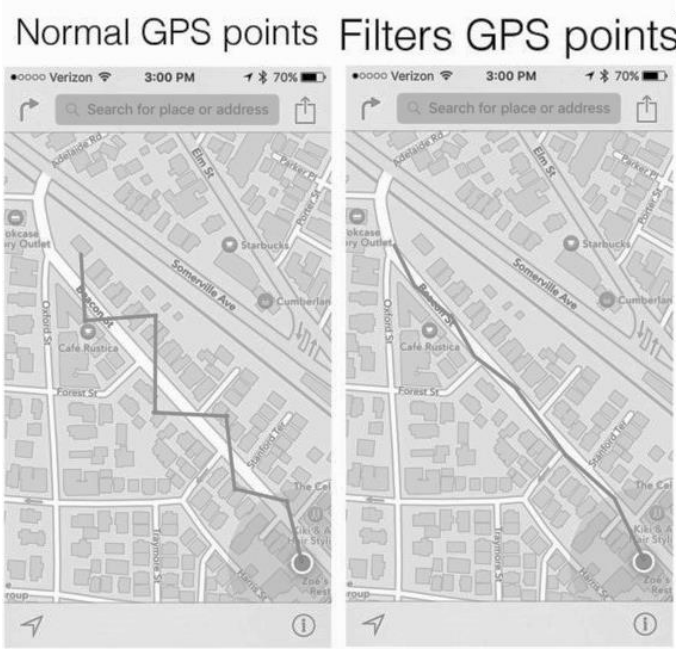
Andrii Skrypnyk

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Beginning of digital era, which has started almost 20 years ago, brought us to idea of global connection between cell phones. Right now cell phones are not only serving needs which were meant by inventors but also solve variety complicated problems. One of them is GPS positioning, simply your phone are small navigators as a tool and source of enumeration of GPS points.

However not many people understand how this principles work. Typically people think that their smartphone send some data to satellites and it just works, as a black box. But it is not the only thing. Variety of software which is built in operation system helps to serve this process.

Developers knew that without preparation they got just some points on map, which is useless for developers and users as well. That is why scientist developed huge amount of algorithms and methods to solve this problem. Also some vendors of phones build in system some basic software to help developers, but that is not enough.



Pic. 1 Comparison of different types of displaying routes

Some of these tools are quite useful. They provide a few location modes for developers, such as usual location updates, significant changes, etc. If it is a mobile vendor, like Apple or Samsung, they can additionally track GPS position, based on Wi-Fi, phone cells, and other devices that provide this additional data for developers.

What is a challenge?

A challenge is to show user-friendly and maximum correct routes for users. For example picture (pic.1) on the left part shows how non-post-processed route on the map looks. As a solution can be used Kalman filters for GPS. On the right part we can see

much more valuable data but it does not look enough valuable. We are still swimming trough the river.

So developers usually do some hacking to make things look better. As you see on picture (pic.2) route is painted not only by thin line but as a line with edges, this trick allows to show less detailed but more appropriate route.

Pic. 2 Result with bolder line

What is more? Usually, people don't walk from point to point and turn on a specific angle. They do some smooth path and we can simulate this. Just smooth path on the corners.

Furthermore, it is a common situation when device returns GPS points far from the real position and this situation needs to be resolved.

Sometimes developers face this problem, when routes have a thousand of non-valid points. This issue was recognized only at 0.3% of users, but it is inappropriate. It was spent tons of hours for researching this problem. The problem was hidden in a system built clock. It is important to remember that core clock synchronizes with satellite time. For each point, device return XX time, also point have XX time too. But some points have XX+YY time, time from future. To fix that problem was added the additional function, for synchronizing time for each point.

Problems with smartphone data will raise again and again till the end of usage. It is important to catch all the issues and resolve them as easy as possible.

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PATTERN "DECORATOR"

Oleksandr Stelmakh
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Pattern "Decorator", also known as "Wrapper" allows you to dynamically add a new charge, without the generation of classes. Thus, such a structure is more convenient and flexible than many classes. For this, the reference to the decorated object is placed in another class called "Decorator". Moreover, the decorator and

decorated object implement the same interface, allowing you to invest several decorators to each other, thus adding the decorated object with any number of new responsibilities. The decorator forwards external calls to the decorated object accompanied by the imposition of additional duties.

Inheritance is one of the forms extensions, but it does not always provide the flexibility. It should be possible to extend behavior without modifying existing code. Composition and delegation are often used to dynamically add new behavior. Pattern "Decorator" provides an alternative to subclasses to improve behavior.

The above definition describes the role of the decorator pattern, but says nothing about how to apply the pattern in our implementations.

The book "Design Patterns Elements of Reusable Object-Oriented Software" as an example, offers widgets. But it much better defines this pattern example with drinks, where tea and coffee are simple drinks that you can decorate with ingredients such as sugar, milkand some other.

Be aware of such principles: encapsulate then what changes; prefer composition over inheritance; program to the interface level; aim for weak connectivity of the interacting objects; the classes should be open for extension but closed for changes.

One of the main advantages is that the decorator is introduced in the architecture is transparent, and the client need not even know that he is dealing with a decorator. Despite all the advantages of this pattern it has also a downside, sometimes the architecture of the application has too many small classes. Introduction of decorators complicated code to instantiate the component. If the architecture involves the decorators, it is necessary not only to create a component, but wrap it in the required number of decorators. It is best to combine this pattern with other patterns such as factory. However, we should not try in any situation to resort to this pattern. You should use this pattern when you want to create many variations or extensions of one and the same essence of the object.

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EXPERT SYSTEMS

Dmytro Stolpakov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Nowadays, it is hard to find person, who did not hear about information technology expert systems. It is one of kinds of Modern Information Technologies. Expert systems are also one of the biggest and most important domains of Artificial Intelligence. It is led into by the researchers at John Hopkins and Stanford Universities.

What Expert Systems really are?

These are the applications in computer science, which is developed to execute difficult and complicated problems.

In 1974, Edward Feigenbaum was developed a view to this field of study. He put on the right path that the world was moving from certain data to certain "knowledge", a modulation which was making suitable by modern technology.

Usually, an these system consolidates certain knowing, which based on containing gathered experience and conclusion. Also there is a regulation, which applies the knowing to specific situation. The system's abilities can be increased with additions to the knowing or to this regulation. These systems may include abilities, which allows to improve their implementation based on learning (reinforcement learning).

Expert Systems have many advantages:

1. Inspection.
2. Availability.
3. Low danger and cost.
4. Reliability.

And disadvantages:

1. Access to large databases.
2. Knowledge acquisition.
3. Integration.

Expert Systems also have a few limitations: they cannot generalize information about new situations, a knowledge acquisition needs time-consuming and labor intensive task.

Expert Systems are very important in many industries. For example: financial services (to detect fraud, suspicious transactions, market trading), telecommunications (image compression and data compression), automobile/transportation (guidance systems), video games (speech recognition, face detection and emotional recognition), aviation (autopilot), manufacturing and signal processing (filtering signals in aids), medicine (diagnosis system), electronics (code prediction, voice synthesis, chip analysis, computer vision).

So, in conclusion, soon as time computer processing operations with knowledge will become to the same distribution as ordinary computer calculations. However, in practice, existing theoretical principles of expert systems are practically implemented highly specialized knowledge based on concrete problems of practice.

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SMART CITY: TECHNOLOGIES AND APPLICATIONS

Olga Sulema
Faculty of Applied Mathematics, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Modern informational technologies provide humanity with wide range of unique possibilities which have not been accessible till recently. Since the time of Leonardo Da Vinci and Jules Verne, people had been thinking of inventions that could simplify their lives, and even now Sci-Fi writers are still dreaming how future technologies will able to make our reality more comfortable, smart and secure. One of the concepts which are already widely spreading among the civilized world is a smart city.

As defined, a smart city is "an urban development mission to integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage a city's assets" [1]. In other words, the smart city is a large urban system of many smaller specific systems working together to minimize human intervention on purpose to increase people's daily life quality and safety. Depending on the specific goals set by the city's planners, the term "smart city" can be also defined as a "knowledge", "digital", "cyber" or "eco" city [2].

There are many reasons why the smart city concept is necessary to be implemented in European countries. In particular, we can mention mass urbanization which happens to be one of the most urgent challenges today. Smart city solutions can minimize its negative consequences and level up an urban environment itself.

As it has been already mentioned, smart city concept consists of both ICT and IoT technologies and solutions. Particularly, the Internet of Things provides wide range of services and devices which can be used in various areas of "smartificated" human activity.

Today the most popular is the sensor technology since sensors are able to connect a physical space – buildings, infrastructure, transport, urban services, etc. – into a single networking system which can be controlled remotely from anywhere in the world.

Applications of the smart city concept can be quite unusual since IoT offers appropriate solutions for almost any urban area. They also significantly depend on climate specificity, city location, economy features, etc. Let us consider some of such specific uses in different countries according to their national conditions.

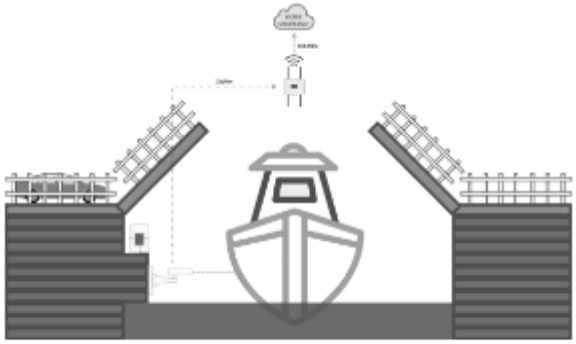

Fig.1. Boats monitoring system

Netherlands location historically created a lot of specific issues which are tended only for this exceptional country. Unlike majority of European cities, Dutch cities have a well-developed water infrastructure with high-density shipping traffic. Since along with habitual roads there are a lot of waterways and canals, citizens use boats and small harbors in their daily routines. That is why there is a substantial necessity to introduce a unique system which would be able to control boats which sails in an urban area [3]. And so, a wireless sensor network has been developed in

order to manage daily flow of boats on canals and, in this way, plan the national water infrastructure (Fig. 1). Dutch company Vicrea specialized in smart city technology together with Libelium sensors manufacturers created an innovated laser solution which is able to detect any ship moving among street canals and monitor direction, distance and speed of sailing. Using the solution, it is possible to improve automatedbridge opening and closing system and so, to reduce cars and boats waiting time. This monitoring system is being planned to work round-the-clock and will provide real-time information about traffic congestion and bridges maintenance.

In turn, being marine country, Greece also has similar issues. Patras port is a quite popular touristic yachting area, especially in summer, and captains of boats face a problem related to the absence of specific marina's reservation mechanisms since it could be difficult to plan a yacht route and precisely follow it during all the marine trip [4]. That is why an application has been developed on purpose to provide mobile navigational and parking guidance (Fig. 2) near the coastal areas as well as e-booking services for marina's reservation. This solution is based on a wireless sensor network which is able to monitor mooring berths, measure the sea water level and observe the weather conditions. At the same time, the developed system can be used for solving other issues, such as water quality controlling, high tide and ebb monitoring, etc., so it is able to be implemented in different urban areas to solve multiple other problems.

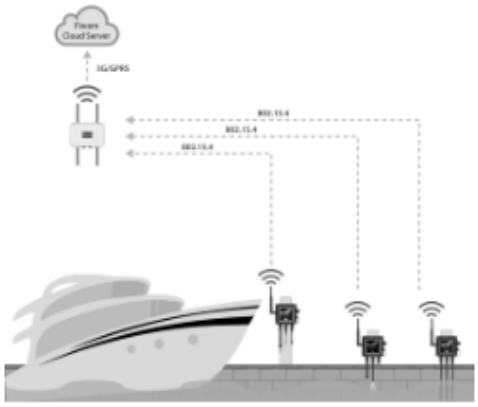

Fig.2. Smart marina system

These examples give an idea how smart city solutions can be effectively applied for unique city conditions but also can be extended to more common problems to solve them successfully. Such smart technologies have been already implemented in most big cities, such as Vienna, Paris, Copenhagen, London, Berlin, Barcelona as well as Toronto, Hong Kong and Tokyo. And now they are starting to be used in Kyiv due to the project "Kyiv Smart City".

So, smart city is a very promising research and innovation area, and modern smart technologies do make the citizens' lives more comfortable, safe and simple.

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COMPRASION OF CROSS-PLATFORM FRAMEWORKS FOR MOBILE APPLICATION DEVELOPMENT

Olha Surai

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The framework is software that facilitates the development and integration of the different components of a large software project. Cross-platform software (framework) implies the software that runs on more than one hardware platform or operating system.

Today the development of mobile applications in all companies for software production involves the use of cross-platform frameworks because users expect applications for different operating systems. That's why now developers write their products not separately for iOS, Android or Windows – they write one application but for all operating systems.

Many world famous software companies have among their products its own framework for mobile application development, such as for IBM – IBM Worklight, and for Adobe – Adobe PhoneGap. But these frameworks have their differences, strengths and weaknesses, some are suitable for solving certain specific tasks better than others. Therefore, below is a comparative characteristic of existing cross-platform frameworks.

Xamarin. It bases on open-source implementation of the .NET platform – Mono. This implementation includes its own C# -compiler, runtime environment and basic .NET libraries. It is designed for cross-platform mobile application development for iOS, Android and Windows Phone with using the C# language. Integrated development environment (IDE) – Xamarin Studio, which is also a cross-platform IDE and runs on both MAC OS X and on Windows. It has many features of Visual Studio. It is also possible to use Visual Studio, but only if you have the business-license. The framework has compilers for iOS and Android, and also Xamarin.IOS and Xamarin.Android – class libraries for C # that provide for developers access to the SDK iOS and Android SDK.

The framework has separate compilers for iOS and Android, as in terms of performance of applications between these operating systems there is a difference – the way they are pre-compiled. But at the same time Xamarin has the advantage that the code is compiled directly into native code, so the behavior, appearance and productivity is the same as that of the native for OS applications. There is Xamarin.Forms tool that allows you to create UI from a set of visual elements, described in the XAML language. To test the performance of the created applications using Xamarin Test Cloud – provides automated testing on hundreds of virtual mobile devices.

Adobe PhoneGap. This framework is an open-source distribution Apache Cordova. It allows you to easily create applications using web-based technologies, such as HTML, CSS and JavaScript. The application works like an ordinary web-page in the WebView. But this framework's API allows the use of all of the devices in the application – camera, sound, GPS, file system, contacts and other. Applications

built using the PhoneGap, using web presentation for the transmission of content. Developing applications with PhoneGap allows you to introduce them to the native – the result is a hybrid application. But applications are not native, and therefore work is more slowly and not always stable, and also have functional limitations. That is why these frameworks should not be used for sufficiently serious projects. PhoneGap is an ideal option for beginners developer of mobile applications, so it suffices to know only the basic web technology and is open and free product.

IBM MobileFirst (Worklight). This framework provides the ability to create web-applications, and hybrid applications (with the ability to send messages and data between native and web modules) as the previous framework. MobileFirst Studio, IDE of the framework, allows mobile developers to use HTML5 functionality, as well as the further expansion of these capabilities with the help of utilities and mechanisms. Among them are the local data encryption, offline authentication, combination of HTML5 and native code, integration with other frameworks. There is also support USSD-services and service applications analysts.

Appcelerator Titanium. The framework allows you to create applications that look and behave like a native, but written using JavaScript (part of the framework is the Titanium SDK, which supports development in JavaScript). Titanium – design, where you can find everything you need to create a hybrid mobile applications.The framework has a shop for ingredients, half of which – free. There is everything you need to create applications: analytics, advertising, cloud storage, social networking and etc. Analytical platform provides monitoring of data about the application in real-time, performance monitoring, logs, failures and the application creation process. The tests are fully automated. Another feature of the framework – built connectors to the most popular enterprise-platform (Salesforce, SAP, Oracle, Microsoft Dynamics and SharePoint) and to the most popular applications (LinkedIn, PayPal, DropBox, Facebook, Twitter). There is also the opportunity to create your own connectors to any services.

So there are a number of cross-platform framework for building mobile applications that run on the same scheme – creating a near native application, or create a hybrid using web technologies. The abovementioned applications are the most popular among frameworksdevelopers. The applications involving the use of web technologiesas well as HTML 5 are developing very quickly and minimal knowledge of it already gives you the opportunity to enter the sphere of mobile application development.

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MOBILE FIRST DESIGN

Roman Suvorov
Faculty of Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today, everyone has some device(smartphone, tablet, etc). And almost all of them are users of the World Wide Web. People buy all kinds of things through online stores, looking for certain information (itinerary, address) through online maps.

- there are over 1.2 billion mobile web users worldwide;
- in the u.s., 25 % of mobile web users are mobile-only (they rarely use a desktop to access the web);
- mobile apps have been downloaded 10.9 billion times;
- mobile device sales are increasing across the board with over 85 percent of new handsets able to access the mobile web.

But for this they need a comfortable and optimized websites. If you go to a site that was created with the screen resolution more than your device, you will not get pleasure from finding interesting information on this site. Not so long ago web-surfing was very difficultfor a variety of devices, but now it's possible thanks to Mobile First.

Mobile First design is basically the practice of ensuring that webpages look great and function great for users on mobile (small screens) as a first step.

Web developers are increasingly committed to the principle of the First Mobile

One of the most important tasks in the development of Mobile First is:

- display content of the most important in the first instance;
- website should be lightweight and optimized, because mobile network connection speed may be low, depending on the user's location;
- the website does not load more resources than the user is required to obtain the necessary information, as the mobile internet is still expensive. additional information should be loaded only to on-demand.

Pluses of Mobile First Approach:

- one website for all devices;
- users will be important content of the page in the first place;
- fast loading pages at a low speed connection;
- user-friendly interface for navigation in a mobile screen;
- minimum number of web resources required to display the main content – saving mobile internet traffic;
- the top positions in google search results.

This helps in keeping the core values which want to present to the users without unnecessary blocks and flooding informations.

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USAGE OF NEURAL NETWORK IN CONTEMPORARY SCIENCE

Artem Syvohlaz
Faculty Biomedical Engineering, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The development of neural networks has remained stable in the first place in technical development. During the entire development of this area the improvement of learning algorithms and classifications in real time was conducted. The most topical problems are: financial forecasting, diagnostics systems, monitoring the activities of network, encryption. In recent years, development of the search for best practices for synchronization of neural networks using parallel devices is enhanced.

The main focus is dynamic neural networks that are used for classification of images. The input signal is directed into the working system, some image (picture, letter or other character), and after passing the signal through this network we get some kind of reflection of the image (the recognized image, letter, etc.). Thus we can say that all modern known neural networks are successfully used for tasks of image recognition and classification of the images, i.e. static information processing tasks. In my opinion this was due to the following reasons:

1. The topology of the neural network is not defined

2. The process of neural network is static. This means that for the system the input signal (image) is placed, then signal is spreading, and finally is measured and compared with the reference value. Then weights of the network are corrected according to the results of signal propagation.

3. Modern neural networks cannot process sequences.

With this static paradigm it is not possible to adapt it for solving the problem of artificial intelligence, because of the need to manage the system in real time, and handle dynamic data streams as opposed to static ones.

The conclusion is that at this point of technological development we should enhance method for implementation of dynamic neural networks for solving problems that deal with data which change in time.

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.NET CORE AS A STANDARD OF THE NEAREST FUTURE

Maksym Trotskyy
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

MicrosoftCorporation dictates rules in the field of software engineeringover the last twenty years. Thus, the .NET platform, released in 2002, has become a new standard for application development under Windows OS, then Windows Phone, Windows Store, etc. At the end of June 2016, Microsoft presented the .NET Core 1.0 platform, which is to revolutionize the world of programming in C #.

The key difference between the new platform and old versions is a complete cross-platformity, to implement which .NET Core was made opensource. Thus, the new version has a single code base which can be used to create and maintain apps on all platforms, including Windows, Linux and Mac OSX.

Of course, the individual components (e.g. file system) need a separate implementation. The model of delivery through the NuGet allows abstract from these differences. You can have a single NuGet-package that provides a variety of implementation for each of the environments. But the important point is that this is the implementation of an internal component.From the developer's point of view it's just a single API, running on different platforms.

The new framework also solves the question of incompatibility of product and framework version. The .NET Framework is a framework which has to be installed for the entire machine. Any changes made in it, affect all applications that depend on it. Advantages of this solution are centralized service, decrease in the size of disk space, sharing native code between applications. However, it's difficult for applications developers to migrate on a brand new framework.

In fact, you depend on the latest operating system version or you have to prepare app installer that puts .NET Framework if necessary. Even if you decided to solve the installer preparation problem, you can face the fact that the framework update can disrupt other applications.

In .NET Core, the problem is solved using NuGet. Libraries of new framework do not suffer from the aforementioned problems, because they are local in relation to the program. In other words, they are distributed as if they were part of your application.

.NET Framework is still a key platform for building rich desktop applications, and .NET Core does not change this. But .NET Core will develop faster than the .NET Framework. This means that at some point in time will appear options available only in platforms based on .NET Core, which will make the new platform a standard of C# coding.

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THE USE OF DOCUMENT-ORIENTED DATABASES IN XRM INTEGRATIONS

Arsen Tymchuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Briefly about MS Dynamics CRM and XRM. CRM system is the system of interaction with clients. As a rule, such systems are used is spheres where it is necessary to monitor transactions with the client, service customer within provided services or during the warranty period of purchased product. A very popular type of

doing business is B2B – "business for business" or B2C – "business for clients". It is also possible to conduct information structuring with standard tools. Classic CRM includes the following components: sales, marketing, service. Sometimes these components are enough for a company to implement tracking processes and carring out marketing campaigns, concluding agreements with customers – actually selling services or products.

But there are many different subject areas where classical approach CRM enough. In this case are based on the classic CRM system expanded its composition is XRM system – extended relationship management.

However, there are many different subject areas where classical CRM approach is not enough. In this case, basing on the classic CRM system its expanded is built, that is XRM system – extended relationship management.

From architectural point of view, CRM system is built with the use of a 3-tier architecture, but it has a lot of web-services in its structure, each of them is responsible for more or less automating of certain processes – i.e. the implementation of business processes or business rules that are formed during consulting solutions. MS Dynamics CRM system is organized on MS SQL database, which is convenient at some points, but in relation to load, that will be set during operation of the system, it is necessary to eliminate unnecessary procedures.

During developing a CRM system, new models are built according to the customer's domain and according to this, in order to avoid high loads on the system structure integration services are developed, where the connection occurs between CRM database, some service (windows-service), web-service, or other structural component of integration and integration database, which in its turn accepts most of the load. The probability of changes in the structure of tables of this database depends on how a certain business process can change or a group of processes connect between each other. In this case, it is necessary to rewrite the services themselves and remodel the database tables structure, and sometimes there are cases, when it is easier to rewrite the database.

The use of Documen-Oriented Database (DODB). A rather decisive solution of such situation can be the introduction in the integration layer instead of a relational nonflexible database, the use of document-oriented database. Such databases are more appropriate for high loads and their structure is more flexible, due to the fact that the structural unit is not table but a document, which in its turn consists of collections of data. In one document, some similar in bas collections can exist, but they differ in the presence or absence of some attributes. Also the collection in the document can contain attribute, which in its turn contains an array of data. Such approach can reduce the number of entities based in integration significantly.

In fact, no matter with what integration service will work or service, and whether this is a relational or any other database, but the performance of integrations will increase by using non-relational approach, which developers try to emulate on the basis of relational database. It results in appearing of empty cells, loss of data, block in the multi-stream connection and receiving data.

Here is an example of architectural integration using the DODB. Let's take banking project, in this case standard CRM will not help. It is necessary to develop

XRM system and the corresponding integration system. Suppose to take a document-oriented database as a basis of integration. Banking system provides a high level load, as the bank has a big amount of clients. Now, with DOBD as the basis of integration, we can develop flexible mechanisms of integration, moreover, by adding new data structures, we will not only previous data tortious with lots of empty fields but avoid the need to rewrite the components of the integration. Search inside of such system is executed in optimal manner, which means that it is a definition of those collections where there is an attribute by which filtering occurs, i.e. all those which completely do not match default filter are eliminated.

In this case, the speed ratio is rather high, both from the point of work and optimality this database integration, and from the developers side – it is just about only introducing new functionality without the need of developing new services.

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PROBLEMS OF MACHINE TRANSLATION

Khrystyna Valchuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Sometimes we replace term "machine" with "automatic", which does not affect the sense. Although the term "automatic translation" has different meaning: it is a program that helps a person translate some kind of text.

Using automatic translation, we expect the following forms of interaction:

- Partly automatic translation: for example, when a translator uses computer dictionaries.
- Systems with division of labor: computer is educated to translate only phrases with a rigidly set structure (the result is not required to be corrected afterwards), but everything beyond the scheme should be worked up by a person.

Nowadays, there are two different terms in the English terminology: machine translation, MT (completely automatic translation) and machine-aided or machine-assisted-translation, MAT (automated). If there is a need to determine both, M(A)T is used.

Moreover, there are two fundamentally different ways to construct an algorithm for machine translation: rule-based and statistical-based.

The current stage of machine translation development can be described as a stage of syntactical word translation. A fundamental unit of the sense is a word, but the definition of grammatical forms and the sequence of words in a generated text based on syntactical relationships between the words in the original text. Similarly, to the formed rules the structure of dictionaries for translations reminds a word dictionaries' structure, in this case the percentage of collocations is quite low.

In spite of the fact that the word is not the only unit of the sense in native

languages, there are a small number of levels of semantic units. Among them morphemes level, word level, collocation level, sentence level, etc. What is more, the sense of the higher level units not always may be determined from the sense of units of the lower level (most meaningfully it might be traced in the morpheme and word layers relationship). Accordingly, the dictionaries for an automatic translation must contain units of various layers.

Depending on style and purpose of the text, the same word could have had different meanings. In some extent this feature is being considered in the systems of machine translation, for instance, removable dictionaries are provided sometimes even for all types of text.

Besides established rules of sentence construction, there are several unprescribed rules in each language called the pulchritude of a language. For example, a literal translation of a sentence "This is my pen" in Ukrainian is "Це є моя ручка" which is formally correct, but Ukrainian speakers do not talk in such way. In this case, it looks like foreigner has constructed the sentence.

In contrast, capital letters and reductions are fraught with another trick. When a word starts with a capital letter, its translation also starts with a capital letter. The effective abbreviations, read as a unit word, are frequent in English literature. A computer will also translate such abbreviations as unified words.

Sometimes it is better to perform a word-processing before translation. Thus, machine translation systems can make mistakes because of reductions ended with a point. If a word with a capital letter follows such a point, computer perceives the point as the end of the sentence. As a result, we get an erroneously parsed and incorrectly translated sentence at the output.

Therefore, it is better to remove the points after reductions. There must not be any word wraps in a translatable text. Text redactor Microsoft Word can easily provide it. The texts resulting in the identification of a scanned image needs a special attention because remained errors often are being the reasons that some words left untranslated in a case of one wrong letter.

Thus, automated dictionary service should take an important place in the systems of machine translation, whose tasks include creation and management (supplementation, correct). The role of a person in the automated dictionary service is marking foreign texts in order to segregate dictionary elements and to set appropriate equivalents in the output language. A machine can also perform a text marking.

To conclude, a computer still cannot fully replace a translator. Is there any sense to apply machine translation systems at all? If a computer translates literary texts, we can get a rough version of texts, which grow to the masterpiece under the hand of a person who does not have strong language skills but is just as good as literary editor. Talking about technical text translation, in a point of using an appropriate dictionary, a quiet passable is not requiring the following treatment, result may get at the output. Actually, the need of redacting a machine translation appears due to the described problems. Overall, the systems of machine translation must have their own editing tools.

The constructing of a qualitative machine translation of the scientific, technical and business texts should base on using of dictionary complexes including semantic

units of different word, collocation and sentence layers. The leading place should take collocations because collocations are more usual for naming concepts than separate words. It is important to abide the rule of preference during translation. According to this rule, the algorithm should isolate and translate semantic units of the highest layer firstly but appeal to the units of lower layers only in a pinch if there is no other possibility to translate the text.

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NEW VISION WITH THE BIONIC EYE

Bohdan Vanchuhov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

According to latest World Health Organization (WHO) data, about 285 million people worldwide suffer from visual impairment. Approximately 39 million of them are completely blind. Reasons for full or partial visual impairment are diverse – from eye diseases to genetic defects, injuries and the action of chemical agents. Vision problems are one of the most common causes of disability.

However, 80 % of the visual impairment can be prevented or cured. Bionic Eye is one of the modern high-tech methods to restore lost vision in some forms of blindness [1].

Modern science and medicine make it possible to create a prosthesis, which in appearance and function like real organs or limbs. Such prostheses and implants are called bionic. Some progress in this area achieved in the development of bionic arms and legs, artificial heart, ear and retina.

Bionic Eye is an artificial visual system to restore lost vision. This is a unique opportunity to restore sight to the blind, even to people who maintain a healthy retina tissue and operates natural transmission path from the retina to the brain. Such implants are intended primarily for patients who are blind due to retinal degenerative diseases [2].

Age-retinal degeneration can develop in old age. Light-sensitive receptors of the eyes begin to atrophy – cease to respond to light, and the person becomes blind. However, the retinal nerve cells do not die. This makes it possible to create an artificial system to restore vision.

One of the leading causes of blindness is a scotoma. This spotshaped defect that is in sight of the eye. Scotoma caused by diseases of the retina or optic nerve, glaucoma.

This system allows you to compensate for the lost visual sensation of full or partial loss of vision. To do this in the eye with a damaged retina implant is implanted – retinal prosthesis, which complements itself with the rest of the retina in her undamaged nerve cells [3].

In some cases, a polymer matrix disc with photodiodes. With it removed the electrical impulses that are transmitted to neighboring nerve cells work. Analog signals from the optical image to an artificial retina, stimulate cells preserved.

Surrounding the image is formed by a video camera, located on the forehead, the IR display, special glasses and polymer photosensor electrodes and holes.

When complete blindness one of the key components of the system are special glasses with an integrated camera. Information from the camera is fed to a video processor, which the patient carries on a belt. The processor converts the image signal and sends it to a transmitter built into the goggles. Then, the transmitter wirelessly sends an electronic signal to the receiver, a built-in photosensor eye and electrodes implanted in the retina. The electrodes stimulate the photosensor functioning visual retinal nerves. Electronic signals received by the optic nerve head in the patient's brain [4].

In August 2008, carried out the first operation to transplant a bionic eye implant called the Argus II, developed by "Second Sight", USA [5]. As part of the patient test was the 76-year-old Englishman, who because of a hereditary disease was blind the last 30 years. After the operation, the man began to see glimmers of light and, according to him, he has learned to distinguish between white and gray socks from black.

In December 2009, one of the panelists of the new technology was the 51-year-old resident of the UK, Peter Lane. His eyes were implanted with electronic photo sensors that send signals to the brain, collected points. Thanks to this man for the first time in 30 years, was able to discern the outlines of objects, recognize letters. In 2012, scientists from the Bionic Vision Australia for the first time implanted electronic prototype bionic eye woman with an incurable disease – a hereditary pigmentary retinal dystrophy. This system is equipped with electrodes 24, and a cable that connects it to a receiving device located behind the ear. The main drawback of this prototype is the ability to transfer only black-and-white image.

Superior Argus II implant is already available for use in Europe. The operation to install it lasts 4 hours, its value is about 115 thousand. Dollars. The implant is equipped with 60 electrodes, which allows us to distinguish the rough shape of objects and large letters, as well as to follow the movement of the object.

The company Retina Nano launched a system called Bio-Retina. Surgery to implant lasts about 30 minutes and is performed under local anesthesia. The sensor is equipped with 576 electrodes and allows the brain to perceive the gray levels.

Improvement bionic eye implants continues. Increasing the number of electrodes will increase the resolution and improvement of sensors – to get color vision.

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ANALYSIS OF SPECIFICS OF CACHING DATA IN INFORMATION SYSTEMS

Dmytro Vdovychynskyi
Institute of Physics and Technology, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Modern information systems require high speed of performance, reliability and cropping. Since the information systems often deal with such data levels, whose size considerably exceeds capacity of free random-access memory (RAM), which leads to impossibility of locating all information in the RAM; an extensive part of information during operation will remain on external media, which decreases system productivity.

Caching technologies are used as a universal method that makes it possible to accelerate processing and representing data to final users. The idea of caching consists in holding processed information in the intermediate fast-access memory, which may be urgent in future.

When trying to access an element, the cache memory will be verified in the first place, and then the operational and main memory. The basic factor that influences the effectiveness of any caching system is selection of the strategy for replacing objects in the cache memory, as it is the strategy that identifies set of objects available to users with fewer delays, than delays of access to objects that are derived from the main or operational memory (RAM). Therefore, implementation of more effective strategies of replacement can increase the efficiency of both a cache system, and the whole system in the large.

As of today, a large number of strategies for replacement of objects in the cache memory have been developed:

5. LRU (Least Recently Used): a caching algorithm that builds on temporal locality (the object, a query to which has been recently made, is likely to be used before long). In this algorithm, those elements are forced out, which have not been used for longer period of time, than others. The LRU algorithm is simple to implement, but its prediction capabilities are considerably limited. Because of its simplicity, as well as thanks to good results in efficiency, this strategy is the most common;

6. SLRU (Segmented LRU): a modification of LRU. For convenience, the cache memory is divided into two segments: secure and insecure.

After the first query, an element is added to the insecure segment, and after the cache hit the algorithm moves the element in the secure segment. At that, inside each segment, there occurs replacement in the LRU algorithm, but only element of the insecure segment are subject to forcing out. When an element is forced out of the secure segment, such element is added to the insecure segment with the maximum value of "age" counter.

Such an approach allows for previously popular elements to stay in the cache memory for a long period of time, while the elements, to which a query was made only once, are forced out of the insecure segment of memory;

7. MRU (Most Recently Used): a replacement strategy, in which an element is forced out, which was most recently hit; this strategy is sometimes more effective than LRU, for instance, in the events of cyclic scanning of big data sets. This strategy is traditional during managing caching of pages of virtual memory;

8. LFU (Least Frequently Used): an algorithm building on counting number of queries to each element, at which those elements are forced out, which are used more seldom than others. Implementation needs security of cache reference frequency.

In most of real systems, information flow is not homogeneous, that is why, with time, this results in a problem of contamination of the cache memory: elements popular in the nearest time, having big values of cache rating, remain in the memory for some time after reference popularity substantially cuts down;

9. LFU-Aging: the core of the algorithm is in adding intervals, during which number of references (queries) to each object reduces, that makes them candidates for replacement.

Implementation needs 2 parameters: A_{cache} – an average number of references for all objects in the cache memory, M_{refs} – restriction to number of references for one object.

Every time, when an average number of references to the objects in the cache memory ($A_{cache}/count$, where *count* is number of objects in the cache memory) exceeds A_{cache}, value of each object is reduced by M_{refs}. If number of references is fewer than M_{refs}, it gets cleared. Therefore, values of reference counters last out at a certain level, as well as ensured is decrease in a relative number of values counters of objects popular in the past.

An issue of size of the cache memory has, at first sight, a trivial decision: the more the size, the better efficiency of the caching system. Indeed, in most cases the more the cache memory size, the less number of cache misses and, as a result, the greater number of cache hits, but the problem of determining an optimal size of the cache memory contains a couple of factors:

Problem of reduction in access speed. Increasing the cache memory size leads to increase in resource intensiveness of operations for searching and acquisition of objects out of the cache, without any alterations in the cache memory access speed;

Problem of existence of regular access models with the number of objects within a cycle exceeding the number the cache memory can house. This especially impacts algorithms of the LRU family. Cyclic instructions of applications occurring,

objects of the information system cannot go, all at once, into the cache memory; as a result, the replacement strategy will be always force out one of the objects, but this object will be definitely used in the nearest future.

Classification of strategies for replacing objects in the cache memory

The table depicts characteristics of objects, as utilized by appropriate replacement strategies, for determining actuality of an object in the cache memory:

Algorithm	Element novelty	Reference frequency
LRU	+	-
SLRU	+	-
MRU	+	-
LFU	-	+
LFU-Aging	+	+

Novelty of elements is a characteristic of an object, used according to the replacement strategy in the LRU, MRU and SLRU algorithms, while LFU applies an element reference frequency as such a characteristic, and LFU-Aging combines these two characteristics.

Analysis of peculiarities of organization and operation of subsystems detected such drawbacks as not always objective removal of elements out of the cache memory, which increases in number of cache misses. One of the priorities areas in the sphere of caching data of the information systems is creation of intelligent subsystems for caching, as well as development of new methods to replace objects in the cache memory, for example, based on algorithms of computer-aided teaching without assistance of a teacher.

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COMMAND ADAPTER FOR GRID SYSTEMS

Oleksandr Verhun
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Grid systems are becoming more and more popular due to calculationsthat get more complicated and larger as information technologies grow. Data analysis, data mining, mathematic calculations and scientific researches in fields like physics, chemistry, biology – those are few examples where Grid is used. Grid is a system of computers, supercomputers connected by the Internet, which shares resources between each other, and allocate the resources to compute end-user task. The main problem of using Grid systems is that, each system has unique interface commands, what makes harder to migrate between different Grids and understand what kind of complete functionality this command provide. The main goal of the paper is to analyze end-user usage problems and suggest a universal command list, which will simplify using Grid and migrating to another Grid system.

There're many popular Grid systems, the most frequently used of them are MoabHPC Suite, Unicore, Global Toolkit. As mentioned earlier these systems have different and mostly unique command list, howerver, there is a very different approach for installing this system. Respectively every Grid has its own advantages and disadvantages e.g.:

1. MoabHPC Suite – optimized job responses, management overheads, scalable.
2. Unicore – graphical interface, monitoring jobs and resources.
3. Global Toolkit – portable, secure protocols, defect tracer.

And the disadvantages of these architectures are:

1. MoabHPC Suite – interacts with user through middleware (command line).
2. Unicore – even though it has a graphical interface, sharing data, scripting and job execution works from a command line.
3. Global Toolkit – all the actions done through REST API.

We can also analyze the commands that these systems use to create processes:

1. MoabHPC Suite – mjobctl –xjob <ID>.
2. Unicore – ucc run [options] -v [UCC_HOME]/samples/data.u.
3. Global Toolkit – curl -data [data] POST / transfer.

As we see all the commands to create a process are different and the way to submit data is different, which makes hard to remember and more importantly to fully understand and use each command.

A way to deal with it, is creating an adapter that will translate own commands into commands of respective Grid system. Commands of this adapter should be self-explanatory, so user will understand what he's writing. E.g. a command for creating a process should look like this:

createjob <filepath>

The whole system will work in such a way:

1) A user enters a command, that is listed in documentation and there is the functionality user needs to accomplish the task, chooses a Grid system in HTML form and submits HTML form.

2) On the server-side this command will translate to a respective command from Grid.

3) The request will be sent to a Grid server, where this request will process, and server will send the result back to user.

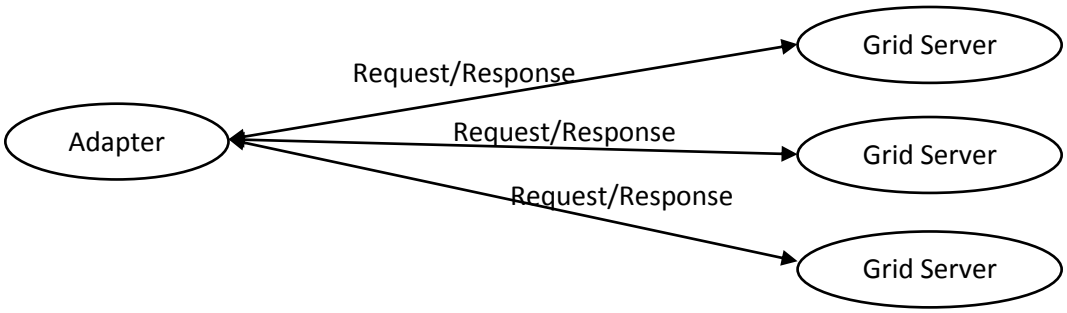

Fig. 1. Network connection between adapter and Grid systems.

The figure shows how this system operates. To sum up, this system will allow users to communicate with Grid much easier and more understandable.

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SECURITY OF ELECTRONIC DOCUMENTS AND THEIR CIRCULATION

Roman Vlasyuk, Ihor Kaznodii
Institute of Special Communications and Information Security, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Security of electronic documents is defined as the status of electronic documents, which ensures the preservation of certain security properties of electronic documents with restricted permission. Privacy is the right of individuals or organizations, when, how and in which the number of relevant electronic documents can be transferred to other people or organizations.

Despite the fact that the confidentiality of electronic documents and their security are related, the secrecy of an electronic document is determined outside the information system. In a broad sense, this problem is a problem of society. In order to ensure the secrecy of electronic documents – possibility of certain people access them – it is necessary to take a decision that does not originate with the technical challenges of creating databases.

Security policy of electronic documents and electronic documents with restricted access that is the basis of creation and effective functioning of a complex system of electronic documents and electronic documents with restricted access protection in the information system. The lack of well-designed security policy of electronic documents and electronic documents with restricted access leads to the absence of methodological and organizational foundation of electronic documents security, and other valuable resources information infrastructure systems of information technology, information systems, and to unsystematic solution of problems of electronic documents and electronic documents with restricted access security.

Considering the problems of electronic documents and electronic documents with restricted access security in the information system we must come from the fact that there are two main opposing parties – the owner of electronic documents in the information system, which has a certain value and requires its protection, and the offender (unauthorized user), who has motives and opportunities for illegal use of electronic documents, which may lead to the application of losses (moral, material, etc.) to the electronic documents owner. The third, independent party, the main task of which is consideration of disputes between the users of the information system,

first of all when one of them is an internal offender, as well as between users and the owner of the electronic documents. In addition, the third party can be trusted by the party and the offender.

The owner of electronic documents, which in most cases is the organization for which these electronic documents are valuable, is responsible for their preservation. In this case, the electronic documents can be regarded as tangible assets (information resource). Information system security is connected with protection of electronic documents in this system. We must clearly understand that electronic documents are the most valuable resource of the system's owner.

The following resource classes are distinguished:

– equipment information system (physical resources);

– information resources (databases, files, data, transmitted communication channels, all kinds of documents);

– software (system, applied, and other utilities);

– service and maintenance facilities (providing necessary operating conditions, energy supply, etc.).

Today, electronic documents and electronic document flow is the main component of the operation of a wide range of information systems in different branches of national economy of the country. Accounting, processing, and storage of electronic documents in information systems are the result of numerous specialists' unit information protection with restricted financial and economic aspects, which has a significant value.

Therefore, protection of electronic documents with restricted access provides:

- procedure for determining the electronic documents, which states electronic classified documents and term of their action;
- the system of admittance and access organization, overseas trips and private parties to electronic documents with restricted access;
- procedure for working with non-classified electronic documents;
- ensure the storage of electronic documents, cases and other material carriers of information with restricted access and their destruction;
- duties of the employees committed to electronic documents with restricted access;
- principles of organization and conducting of monitoring software mode when working with electronic documents and electronic document management, which has limited access;
- responsibility for the disclosure of information, the loss of the electronic documents that contain information with restricted access.

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IS XAMARIN DICTATES THE FUTURE?

Pavlo Vorontsov
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Xamarin is a IDE for mobile cross-platform developing owned by Microsoft Co. With using such languages as C# or Visual Basic developers can write single backend for such platforms: IOS, Android or Windows.

Its mono framework consists of (similar to .NET):

- mono runtime (CLR ~ JVM);
- BCL .NET (set of managed libraries CIL) for stringing, filing IO, networking, or anything else;
- sets of command line utilities (compilers, linkers, code signing etc);
- IDE also called as MonoDevelop – Visual Studio on Linux and MacOSX.

There is a general scenario, that we all probably very familiar with as developers: when you think about creating an application, you open your IDE and create a new project or open an existing one and start to write it, using the language you are familiar with. And once you are done with your application, regardless of what it is, you can deploy it out to some environment, whether it is a web application, or desktop application, or even a mobile application that would target something such as android devices, for example. And that's something that we are all relatively familiar with, regardless of what background you come from or what type of development you do, you typically understand that as a truth.

So, Xamarin is the modern solution for running applications, written in one language, on different platforms. As any programming environment, it has a number of products targeted on specific outcomes such as:

- Xamarin.Forms: the API is used to design native applications across the iOS, Android and Windows platforms (which is considered to be a cross-platform UI toolkit);
- Xamarin.iOS & Xamarin.Android: helps to develop environments used to build and deploy platform-specific C# code;
- Xamarin Test Cloud: it is a cloud-based application testing platform, which has the capability to test big amounts of devices and automate mobile application testing;
- Xamarin Studio & Xamarin for Visual Studio: Integrated development environments where the C# code base is written.

But, nevertheless, as any development framework, it has its own pros and cons. Main pros of Xamarin use outlined in:

- Experience that needed. The development process is based on C# and the .Net framework knowledge. That's why it is not necessary for developer to have any experience in creating native mobile applications, developing in Objective-C nor Android Java.
- Right for Simple Apps. Huge variety of blank projects and thousands of prewritten functions for iOS, Android and Windows Phone makes developing process as easy as it possible. The emphasis is put on the "simple native applications," where simple is a relative term.

Main cons to consider:

– Crashing. Xamarin Studio causes some, for instance, Mac devices to crash sometimes. Even upon using another application with Xamarin Studio opened, some of these would still crash.

– Cost for starting. Another factor to consider is the cost of the Xamarin license. Xamarin offers 3 pricing plans except for free Commercial one (which is not allow to develop commercial products), "Indie" ($300 per year), "Business" ($1,000 per year for 1 license) and "Enterprise" (about $2,000 per year for 1 license).

– Its Adoption and implementation on a market. If Xamarin has solved the cross platform question of "writing the application once and deploying it for many times," it does not seem that the job market has followed it along. In a recent job requirements search, very few descriptions included Xamarin. So far, industry adoption of the development software has been minimal.

So, the question of Xamarin implementation is quite contraversive. Firstly, you have to decide, whether you will write native, hybrid or cross-platform application, and then choose the most proper way of its realization. According to written above, Xamarin can be a prospective solution for mobile application development. It really helps to succeed using the best approaches and practices gathered together.

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MULTIPURPOSE MICROCONTROLLERS IN TELECOMMUNICATION

Maria Voronyuk

The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

At this stage of development, an urgent topic of the new information technologies that filled almost all spheres of life has become. One of the most important and popular information technologies is the Internet of things that became a part of many devices and applications. There are many different types of telecommunications equipment that can perform various tasks, but it is very large mostly, expensive and is not always universal equipment. To solve this problem, we can use microcontrollers as modular equipment for telecommunication systems, which perform many functions. There are some advantages of microcontrollers:

– optimal price;
– small size;
– a wide range of choice of bottom product;
– the possibility of adaptation to perfom specific tasks;
– can be used as a component of a complex system;
– quick hardware and software reconfiguration;

- a large number of applied libraries;
- durable in operation;
- alteration of an algorithm;
- the availability of effective free methods of the development.

For example, using a microcontroller for the data center, you can implement technology to collect, monitor, analyze, emergency power supply. We do not have to use a large number of servers that have high price and large size. Simply we will have the opportunity to perform all the functions we need for a microcontroller. It also will reduce the number of attendants.

The average price of microcontrollers ranges from $ 100, and the average price of servers for data centers starts from 300 dollars.

Using of microcontrollers in telecommunications allows significant savings to replace a large number of equipment units multiple devices.

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GENERATING ARTISTIC TEXT WITH RECURRENT NEURAL NETWORK

Vadim Yanko

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The end of the 20th century can be considered a new step in the history of neural networks. Previously they were used for pattern recognition, prediction and management tasks. Presently they are used for a much broader range of problems, in particular, for such unexpected things as automatic generation of texts, writing music, creating trailers to films, etc. This application of neural networks is ambiguous in terms of artistic value, but it is interesting as it demonstrates the hidden capabilities and potential of neural networks. The application of them to weakly formalized problems may be the next step in creating a complete artificial intelligence. This is the task of current importance for the scientists around the world.

For a start, we need to understand what a neural network is and how it works. It is worth noting that it is a mathematical model, which was built on the principle of functioning nerve cells of a living organism. However, this model was too inaccurate, because the human body is a much more complex system than we can imagine and cannot be described by a simple mathematical object.

The pioneers, who tried to simulate the processes occurring in the human brain, were the neuroscientist Warren McCulloch and the mathematician Walter Pitts. Half a century later we can get substantial original text using artificial neural network. For example, we want to generate a scenario for a comedy film. To train our algorithm, let's "acquaint" it with dozens of scenarios of classic comedy films. At first, it examines what letters go one by one, and then analyzes the sequence of words and expressions. It is important to analyze the whole paragraphs, to create original phrases, not just connect random parts of the original texts.

The trained neural network receives the input list of aspects and dozens of scenarios and generates a new text. I do not think that this algorithm is able to replace Woody Allen at this stage of development, but who knows – maybe in a few years there will be a completely new contender for the "Palme d'Or" at the Cannes Film Festival.

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INTRODUCTION INTO XAMARIN

Bogdan Yarema

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Xamarin is a framework for cross-platform mobile development created by the same engineers who created Mono for Android and MonoTouch that are cross-platform implementations of the Common Language Infrastructure (CLI) and Common Language Specifications (often called Microsoft .NET). Now it is owned by Microsoft and is believed to be a fast growing and continuously advancing tools and technology. There are a lot of advantages of using Xamarin platform and therefore it is reasonable to assume that later it may be considered a main approach to mobile development. In the world of development new tools replace old ones if they are better or at least considered better by software engineers. There is already one million people who use it. Moreover since Microsoft bought Xamarin it became free for all to use.

One of the benefits Xamarin can provide developer with is the ability to write using a single programming language. There are a lot of different mobile platforms nowadays such as Android, iOS or Windows Phone. However, there are not any differences among their users from a developer's point of view. When a company decides to create a mobile application it tends to try to cover all possible platform to maximise the number of possible users. Sometimes it is even the only possible solution if a consumer of a final product is in fact a group of people who use different mobile platforms. Therefore Xamarin is a great decision due to making it possible to write using a single programing language which clearly contradicts to the native OS development which requires the knowledge of a language per platform.

What does it mean in a company perspective? Not only it will have no need to spend money on teaching someone a language but also it will have an opportunity to have three times fewer mobile developers.

Other benefit you can reap by using the platform is that you can actually write less code to have the same result. To explain, Xamarin has a Xamarin Forms technology as part of its platform. Xamarin Forms is a tool which allows to write a common code for all UI and inner logic of an app. Thus it may take much less time to write three apps for all popular mobile platforms. It is a considerable advantage in comparison to the native development.

It is also worth mentioning and keeping in mind that even though it is written on a not native language it works just as fast as a native application or sometimes even faster thanks to C# being such a powerful and featureful language.

Last but not least, Xamarin is using C# as its main programming language which is a great deal. Whether C# is strictly better than any other language that can be used for mobile development is a subject to debate, however it is undoubtful that it allows its users to use all the features available for C# developers as well as using so powerful programming tools like Visual Studio which may be the most functional development environment available.

Moreover, there are a lot of situations when a company already posses a site developed using C# as well as server and desktop application. Additionally, the technology used for Xamarin Forms is almost the same as for Windows Presentation Foundation. Therefore it might be really convenient for such a company to use Xamarin because its software engineers have no need to study anything totally new for them to work.

To conclude, Xamarin is a powerful tool with fast growing community for mobile development which not only makes it easier for developer but also lowers the price of a final product therefore increasing its competitiveness. Furthermore, it provides a programmer with all the benefits .NET and C# can offer. I believe this platform to be the inevitable future of mobile development at least for a few nearest decades.

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VIRTUAL REALITY IN MEDICINE

Yevhenii Yaremenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

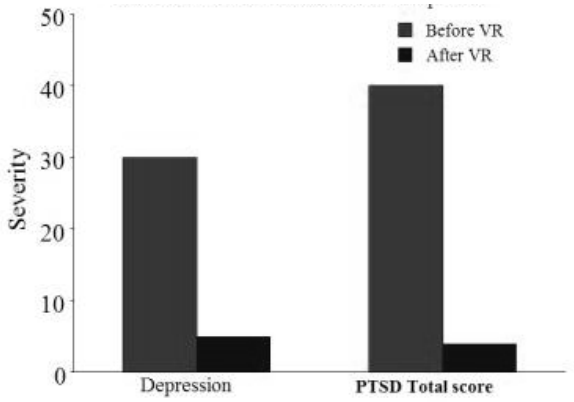
Virtual reality –h the definition of this concept is quite easy – it contents both of "virtual" and "reality". This two terms have opposite meanings but in scientific

literature it comes as "a three-dimensional, generated environment which can be interacted and explored with by a person". The route of this innovation comes from human's perception systems. Since our childhood we all have learned that we have five senses: taste, touch, smell, sight and hearing. So, virtual reality works with this. Nowadays it is more and more usage in medical field, because of it several advantages comparing with conventional systems. Medical VR is an area with incredible possibilities for human's being. It has not just changed the imagination of scientist and computer fans, but also moved and cause the progress in the achievements of clinical researchers and medical practitioners. Despite the field is new and innovative, there are already a numbers of great examples of VR having a positive effect on patients' lives, state of mind and physicians' work. The goal of this article is to explore and to predict the development of such technology in medicine in the nearest future.

One of the most popular usage of virtual reality is to conduct the experience that provide patients with controlled environment in which they can face fears and even repeat situations that cause such illness or fears. Of course this help them to rethink their life, easily stop being dependent on their previous memories, circumstances.

Some of the soldiers who were on the war or had faced any disaster, suffer from post-traumatic stress syndrome – sometimes this brings them to suicide. The Southern California Institute for Creative Technologies helps veterans using VR in which reproduce a scene from life – as a basis for understanding the time and circumstances in which a person was injured. One of the patients was sure enough that it was his fault that his comrade dead in the battle. Virtual reality has proved that he did his best, and it contributed to the improvement of his condition.

There were different evidences that shown how post-traumatic syndrome was treated with virtual reality in patients affected by the terrorist attacks September 11, 2001. The image that was shown a terrorist attack in a virtual reality. The model is designed to help the patient come to terms with this event.



Scientists affirm that virtual reality can help people to fight phobias. Group of people from New Zealand had created an application that fills patient's environment with virtual monsters, spiders, etc. The monsters can interact with real things on walls and desks: crawling over tables and books, disappearing under the cupboard, etc. Researcher team hopes it will become a future treatment for people with arachnophobia.

The experience in a hospital is even more stressful and mentally burdening for small children who miss their parents, their best toys, favorite bicycle and generally, their lovely home.

Now, a Dutch company made their dreams come true. Through a smartphone or virtual glasses, researches live to contact possible with a 360-degree camera at the

patient's school, home or special place such as a birthday celebration or a basketball game. Though hospitalized, young patients can relax and still enjoy their lives.

So technology of virtual reality is growing more and more every day and it can help to more people become health and live happily.

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VOLTE COVERAGE IMPROVEMENT BY HARQ

Bogdan Yarosh
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Today the rapid growth of demand on data transmission technology in cellular networks has increasingly raised the question of restructuring network architecture with a focus on data traffic. The majority of network operators and providers of telecommunications services have decided to expand the system of Long Term Evolution (LTE), which can only provide packet services. All voice telephony is gradually moving to a new voice packet switching service, called Voice over LTE (VoLTE). One of the main problems of the architecture based on packet switching is not designed support of voice delivery, throughout short enough transmission time interval to reduce the continuous delay. It makes VoLTE be based on a packet with a very short duty cycle.

The most optimal idea of coverage efficiency improvement is to increase VoLTE duty cycle of transmission data. The solution to this problem can be the use of the hybrid system of automatic repeat request (HARQ). HARQ performs the task of re-transmission data blocks on MAC-level if the sender has not received confirmation of the successful transfer of receiver.In general, HARQ is a mechanism which is designed to correct errors at LTE – MAC. Each user of the system has numerous parallel stop – wait processes. While expectating a request from one process, other transport blocks are sent by means of other processes. Such a construction of transmission processes guarantees the maximal carrying capacity of flow line. Another advantage of the HARQ system is only one bit signal of request for process instead of review with sequence numbers.

The main drawback of the HARQ technology is that there can be long delays and if a delay will exceed duration of shot (20 ms), it can result in the collision of voice packages and their subsequent loss. A large number of HARQtechnology retransmissions is not considered to be a good value system. According to the requirements for quality of service and minimum delay, optimal system has to use 3 retransmission HARQ.

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INNOVATIVE TECHNOLOGIES IN MODERNITY

Sergiy Yashchuk

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

It is hard to imagine modern manufacture and other spheres of society without information service that helps to handle large amounts of information faster and easier in terms of the present day.

The field of information technologies develops in high rates. New details of the IT sphere are developed and improved every day. New innovative technologies are being implemented around the world every minute.

The market is in crisis and unstable situation today, and this causes an acute problem of effective investment of resources and funds. The information industry is currently the most promising and risky trend in the innovation sphere. Information technology due to its dynamic development provide many opportunities, particularly for the modernization of labor, increasing production capacity and reducing costs. The experience of recent years proves that innovative approaches in the field of IT beneficially effect on the impact of society, increasing manufacture at enterprises, implementation of new jobs, creating new services.

We can see many technological trends in 2016 that may soon be widely used in everyday life and change it radically.

The Japanese company Softbank released the first generation social robots named Pepper in 2015. It is important for every person to talk with others and share with them their emotions, ideas and everyday events, and everybody wants to be listened to with interest, supported and loved for who they are. Therefore, these works have been developed with the aim of solving problems and overcoming difficulties in people`s communication. The 1,000 copies were sold in less than a minute. These machines are able to communicate with us, understand us and adjust their behavior according to our responses, also they do not need to be fed. Many other companies also promise to release such robots in the near future. "Blue Frog Robotics" company is working on creation a robot that will detect facial expressions.

The development of social robots is not so fast, and the world may soon see the bots, which will help us increase productivity, make the company and tell us what other people are doing. These special programs and applications automatically perform any action. Pilot bot "Microsoft Xiaolce" speaks northeastern Chinese, bases in a smartphone and conducts personal interviews with the user as it is able to

remember details of previous conversations. Bots will be able to do other things, except communication, for example, to tag and sort materials in real-time, atomize meetings, update statuses and other things that will allow us to free up your time for more important tasks.

Recently, there have been significant achievements in the field of personal genomics. Person's mikrobiom may become the next step in personalizing of people's health. These bacterial microbiome interact with cells and affect health all time. Everyone would be able to affect easily on it's personal mikrobiom to improve health and fight with diseases such as obesity, allergies, diabetes, cancer and even mental illness. Research in this area is just beginning, but various innovative start-ups are developing methods with using of bacterial samples from the gut – through this data they can identify individual reactions to foods and choose the type of food accordingly.

Crypto currency of bitcoin is going through their ups and downs, and despite on this financial institutions continue investing in bitcoin and looking up ways of using this technology to perform various transactions. Technology chain of blocks (a kind of database that stores all transactions that once took place), which has such features as transparency and security, is an ideal basis for the transferring of money. For this reason, technology is interested in by both financially and in other sectors, including in the social sector. Perhaps, the technology chain of blocks would go beyond monetary system and start to be used not only for payments, but also in a variety of areas – from health care to crowdfunding and music.

The world is rapidly changing and mankind is constantly getting new problems to be solved which need technologies that can develop equally quickly, even if they seem the epitome of science fiction. These innovations from the field of science and technology could radically change our lives.

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USER EXPERIENCE IN NETWORKS

Oleh Zanchuk
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Technology has become an integral part of our daily environment for several generations. It simplifies our lives, teaches us, unites and divides us simultaneously. We cannot imagine our life without technology and forget that it is created by people like you and me.

In particular, we cannot imagine our life without the Internet. The global network interaction experience plays a more important role than in the case of other products. As a matter of fact that customerpresented to himself web-site is almost always a "tool of self-service". There are not instructions that would explain everything in advance; no support which could seek help. Therefore, users based only on their own experience, intelligence and intuition.

Most sites do not recognize the existence of the problem, the user has to understand himself around. But exactly a positive experience causes a strategic role in the success of any website.

Whatever the goal to create a website, it provides information or content. And one of the main goals of the site is to submit this information in the most effective way. It is not enough just to put information on the website. It must be presented so that people can perceive iteasily. Otherwise, the user of the site cannot understand, you offer goods or services it needs. And even if he can find this information, user may decide that cooperation with you is as bad as your site.

If the experience with site is negative, the user never returns there. If the experience is positive, but your competitor's site is even better, the user will go to a competitor. Ultimately, any company seeking to understand what brings profit equity, "index called return on investment (ROI – return on investment) is usually measured in monetary units, but the return on investment can be expressed in the level of conversion" [1]. Whenever there is encouraging customers to take the next step in building our relations, customize the interface to your liking, or to subscribe to the newsletter by e-mail. There are conversion rates which also can be calculated. By tracking the percentage of users what "make a step" (converted) to a new level of interaction, we can measure how much our website serves the purpose of the business. While building a website it is important to distinguish the following levels: the strategy level, the feature set level, the level of the structure, the layout level and surface level.

Successfully passing these stages, only one could argue about the possible positive user experience and the success of the site.

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THE PROBLEM OF AUTOMATIC TRANSLATION OF JURIDICAL TEXTS AND DOCUMENTS

Bohdan Zhukovetskyi

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

There are numerous potential advantages of machine translation in jurisprudence. Firstly, legal documents are highly standardized and have definite structure to avoid misunderstanding and confusion. Human factor in translation may lead to ambiguousness in statements. Secondly, human-made translation is time-consuming while automatic one is much faster. The problem is that there is no

machine translation system with high level of trust so translation result must be checked by professional translator. Thirdly, translation of juridical texts is a complicated task itself since law is a specific area connected with social, political and cultural peculiarities of the particular country. In certain circumstances, there may not be appropriate lawyer to deal with juridical text while automated system is available everywhere via computer network.

However, usual ways of automatic translation (e.g. word-for-word or statistical translation) are not applicable for official documents. That imposes challenge of creation new machine translation system that will be both relevant and highly trusted. High level of trust means that result of translation does not require any human reviews or verifications. System must keep not only semantics, but also stylistic features of a document.

There are different types of legal document and each one has its own peculiarities that means that each one may be translated using different approaches. Laws, regulatory legal acts, contracts, legal resolutions, memorandums and statutory documents contain different data and requisites, but also have common features and clichés. For those kinds of documents we consider using combination of rule-based and statistical approaches.

Commonly used blocks, clichés and requisites will be translated word-by-word considering grammar structure, special juridical vocabulary, legal requirements and other kinds of rules. Other parts will be translated with the help of statistical method (used by Google.Translate, for example) like any ordinary text. First part must be perfectly translated automatically. All conflicts of rules must be highlighted and solved by professional translator, and also rules for this case must be added to the system. Second part (which was translated with statistical approach) requires mandatory human verification. This approach is different from hybrid machine translation where rule-based translation is post-processed with statistical tools, or vice versa.

To implement sufficient statistical translation of legal documents, proper parallel corpora in machine-readable format must be integrated, and those corpora must have higher priority over corpora of artistic texts and other specific spheres.

Other kinds of documents, such as powers of attorney, apostilles and notary certificates have strict pre-defined structure. The approach to their translation lies in human-verified translation with highlighting of all parts which are changeable (contractor requisites, dates, attachments and so on).

Actually, when using this system, documents are not translated but actual version of document in target language is obtained from documents basis. All changeable parts are translated with all available approaches: rule-based, word-based and phrase-based, and even with statistical approach, if necessary.

Juridical documents are highly standardized, that is why machine translation can be implemented with existing level of technologies. However, there are no existing tools, so the problem of choosing and improving proper techniques is still actual.

Finally, the way to solve the problem of automatic translation of juridical texts and documents is creating proper parallel corpora of legal texts, vocabulary of

juridical words and phrases, and multi-lingual templates for commonly used kinds of documents. Translated document must be properly identified to choose appropriate set of tools for its translation.

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NEXT GENERATION COMMUNICATION NETWORKS

Anastasiia Zhuravel
The Institute of Telecommunication Systems, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

Next generation communication networks are being elaborated to find a solution for current wireless network problems caused by limitation of available spectrum and the inefficiency in the spectrum usage.

This networks provide high bandwidth to users via heterogeneous wireless architectures and dynamic spectrum access techniques, which allow the cognitive radio to work in the best available channel.

Cognitive radio technology is the most effective technology that enables this network to use spectrum in adynamic way. Also cognitive techniques can be used for opportunistic spectrum access.

Research in this area is still in its infancy, but it is progressing rapidly.

The main functions for cognitive radio technology in networks can be represented as follows:

– Spectrum sensing: this function allows the cognitive radio to adapt to its environment by detecting spectrum holesand sharing the spectrum without harmful intervention.

– Spectrum management: taking the best available spectrum to meet user communication.

– Spectrum mobility: networks focused on the use of spectrum in a dynamic way by allowing the radio terminals to work in the best available frequency band. Spectrum mobility is defined as the process when network user changes its frequency of operation.

– Spectrum sharingis one of the main problems in open spectrum usage in Next generation networks. Spectrum sharing cognitive radio networks allow cognitive radio users to share the spectrum bands of the licensed-band users.

Upper layer issues, such as routing, flow control and congestion control are also necessary for the realization of dynamic spectrum networks.

The performance of Next generation networking functionalities directly depends on the properties of the spectrum band in use. In particular, the effects of the selected spectrum band and the changes due to spectrum mobility must be carefully considered when designing communication protocols.

In addition, the functionality of spectrum management such as spectrum sensing and spectrum handoff should work in cooperation with the communication protocols.

Thus many researchers are currently engaged in the development of communication technologies and protocols required for Next generation networks. However, to ensure efficient spectrum-aware communication, more research is needed.

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MACHINE ETHICS

Lyudmyla Zinchenko
Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The developing academic field of machine ethics is committed to ensuring more secure artificial agents as they get increasingly common throughout society. Motivated by planned following generation robotic systems, machine ethics typically explores decisions for agents with autonomous features intermediate between those of current artificial agents and humans, with constructions designed incrementally by and implemented in a society of human agents.

These assumptions significantly simplify the task of designing a desirable agent and represent the near-term future well, but there are also instances in which they do not hold. Separately, they should not be applied to synthetic agents with human-level or greater opportunities. The potentially very large effects of such agents suggest that the pre-analysis and research is valuable. This article describes some of the additional problems such asscenarios to create machines ethics.

The research area of machine ethics (also called roboethics) has recently emerged as a subfield of Artificial Intelligence focusing on the task of ensuring ethical behavior of artificial agents (commonly called AMAs, Artificial Moral Agents [Wallach, Allen, and Smit 2008]), drawing contributors from both computer science and philosophy.

By focusing on the behavior of artificial agents the field is distinguished from earlier work in ethics as applied to technology, which concerned itself with the use of technology by humans and on rare occasions on the treatment of machines by humans (Anderson and Anderson 2007a).

Opinions within the field part on the question whether it is desirable, or even possible, to construct AMAs that are full ethical agents, which like ethical human decision-makers would be capable of making explicit moral judgments and justifying them (Anderson and Anderson 2007a).

While Isaac Asimov's "Three Laws of Robotics" are widely recognized to be

an insufficient basis for machine ethics (Anderson and Anderson 2007a; Weng, Chen, and Sun 2009), there is little agreement on what moral structure AMAs should possess instead.

Suggestions range from applying evolutionary algorithms to populations of artificial agents to achieve the "survival of the most moral" (Wallach, Allen, and Smit 2008), neural network models of cognition (Guarini 2005) and various hybrid approaches (Anderson and Anderson 2007b) to value systems inspired by the Golden Rule (Wallach, 1 Machine Ethics and Superintelligence Allen, and Smit 2008), virtue ethics (Wallach, Allen, and Smit 2008), Kant's Categorical Imperative (Wallach, Allen, and Smit 2008; Anderson and Anderson 2007a), utilitarianism (Anderson and Anderson 2007a), and many others.

As the refinement of artificial moral agents increases, it will become more essential to build completely common decision-making procedures that are not based on assumptions of special types of agents and situations to generate moral behavior. Since such development may demand major research and it is not currently known when such procedures will be required to lead the construction of very powerful agents, the field of machine ethics should begin to explore the topic in more detail.

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THE DEVELOPMET OF VIRTUAL REALITY

Viktoriia Zuikova

Faculty of Informatics and Computer Science, NTUU "Igor Sikorsky Kyiv Polytechnic Institute"

The virtual reality is the huge marvelous world. Though it is possible to

understand the Internet as a certain interpretation of virtual reality, actually its potential is much more. This is the place, into which the person can plunge entirely and finds there much more, than in real life, without thinking of distinguishing virtual from the real. At the moment, different hardware are developed for a full exit in virtual reality: Omni, Oculus Rift, and also for creation of augmented reality: Google Glass and others. It can happen that with the development of high technologies in this sphere the virtual reality will hold a firm place in our life and will provide people with huge, almost boundless space for conducting any affairs.

The idea of virtual reality is already existed for lots of years, but only in the last some years the world has approached so close to the possibility to feel it. The term "virtual reality" was included into the using only in 1985, thirty years ago. The first technical realization of the device, which according to the plan of the developer Ayven Sutherland, had to immerse people in the fictional world, was issued in 1968. Because of the huge sizes and side effects it was called "the Sword of Damocles" and the idea sputtered out on it. However, Bill Gates considered that the 640th kilobyte has to be enough for everyone.

This period was postponed until 2000 in the heads of people as "the history of development of virtual reality". Therefore, today it is not a surprise with somebody in a helmet and virtual exercise machines and therefore sceptics shrug shoulders and said that "all this has already existed". There is the mind that the virtual reality is with us and it didn't disappear. But there are some fans to break templates in this world.

Who needs virtual reality? Why do people want to be fenced off from the world behind convex lenses? But there is one answer for all questions: it is really coolly. The virtual reality will come to us quicker, than we expected, and the trend promises to shoot more powerfully, than above-mentioned movie theaters in 3D, sanctions or new iPhone. Gamers, who have armed with inexpensive fonts, will find a second wind and for many years there will be gone in virtual reality. People will get chance more simply to test themselves as the racers of "Formula One", the pilot fighters or the captains of "Enterprise". Special prospects are promised by application of virtual reality in medicine and in the battlefield.

What is next? The world around you will be filled with interactive elements, the emerging helps and the advertising, which will importunately be emerging at every turn. It doesn't depend on what you will wear – a helmet, glasses or lenses, the main interface – a human eye – remains invariable. We "see" the most part of information. Let's agree, it would be very interesting if everything that we can see, it will be possible to change at one moment.

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MODERN INFORMATION TECHNOLOGIES

СУЧАСНІ ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ